THE FISHES OF MANITOBA

By
DAVID HINKS, B.Sc.
Biologist

I.D.

IAIN DICKSON

THE FISHES OF MANITOBA

By
DAVID HINKS, B.Sc.
Biologist

Reprinted May, 1957, by Lithography
with a supplement by
J. J. KELEHER
and
B. KOOYMAN

PUBLISHED BY
THE DEPARTMENT OF MINES AND NATURAL RESOURCES
PROVINCE OF MANITOBA
1943

FOREWORD

When it was decided in 1939 that a report on "The Fishes of Manitoba" should be published by this Department, it was only natural that David Hinks, B.Sc., should be asked to undertake the work. While an undergraduate at the University of Manitoba, he had specialized in hydrobiology. Following graduation he joined the Fisheries Branch of the Department of Mines and Natural Resources and had charge of biological surveys covering a large number of Manitoba lakes. In this work he gained a wide reputation in scientific circles for his thorough and painstaking investigation.

By early 1940 the manuscript of "The Fishes of Manitoba" had been almost completed. Like thousands of his fellow countrymen, however, David Hinks decided that he could not pursue his peacetime work further while the world was ablaze and while freedom was so sorely threatened. In July, 1940, Mr. Hinks enlisted in the Royal Canadian Air Force, where he trained as a navigator and observer. On July 28th, 1942, Flight Sergeant David Hinks was amongst those who failed to return from a night bombing raid over Hamburg. The official record states that he was buried in Ohlsdorf cemetery in Hamburg, Germany.

In the preparation of the manuscript of "The Fishes of Manitoba" several authorities on various aspects of the subject collaborated closely with Mr. Hinks. Their warm personal friendship for the author made them particularly anxious to assist in rounding out the work which he had all but completed. While those who rendered assistance in the preparation of this work were too numerous to mention, Mr. Hinks would undoubtedly have wished to acknowledge particularly the assistance given by:

Professor J. R. Dymond,	Director, Royal Ontario Museum of Zoology, Toronto,
Mr. Ferris Neave,	Pacific Biological Station, Nanaimo, B.C.,
Professor R. A. Wardle,	Department of Zoology, University of Manitoba,
Dr. James A. McLeod,	Lecturer in Zoology, University of Manitoba,

George E. Butler, Supervisor of Fisheries, Province of Manitoba.

In "The Fishes of Manitoba," the fisherman, naturalist, teacher and student will find a fund of information gained from many sources and embracing the latest findings of our fishery research workers. It is now made available by the Department as a contribution to the better understanding and appreciation of one of our greatest natural resources.

J. S. McDIARMID
Minister of Mines and Natural Resources.

Winnipeg, Manitoba, March, 1943.

INTRODUCTION

Since publication of "The Fishes of Manitoba" in 1943 new information concerning the fishery resources of this province has been unearthed by various investigators.

A supplement has been added to this reprint of the book in an attempt to make known some of these new facts.

The supplement is recommended to every reader as a source of additional information.

F. C. BELL,
Minister of Mines and Natural Resources.

Winnipeg, Manitoba, July 10th, 1956.

PREFACE

With the exception of certain pamphlets of a more or less technical nature, very little has been published concerning the fishes of Manitoba. Although much information is contained in the publications of American fishery investigators, the majority of this is too technical to be understood by, or too widely scattered to be readily accessible to, the average fisherman. The present work, therefore, is an attempt to gather together the pertinent information, acquired through many years of field work and an exhaustive review of the existing literature relating to fishes, in a form which may be of interest and value to fisherman and student alike.

To fishermen in general and anglers in particular the questions which first come to mind when an unfamiliar sort of fish is encountered are: "What is it?" "What does it eat?" "What good is it?" and so on. To provide the answers to such questions, to the full extent of our knowledge, is a primary object of this book.

"To the full extent of our knowledge" is said in all humility, for the author realizes, perhaps more keenly than the average individual, that the state of this knowledge is far from satisfactory. However, it is hoped that by the dissemination of even the fragmentary facts a spirit of enquiry may be fostered amongst the fishermen of the province—a spirit which will not only add to the individual's interest in his work or sport, but will tend to increase the general body of information so vital to the proper use of a valuable natural resource.

The writer wishes to express his sincere appreciation to Dr. A. D. Bajkov for much valuable assistance in compiling the material of the book and in the preparation of a number of the illustrations. Thanks are also expressed to Professor R. A. Wardle and Dr. J. A. McLeod, of the Department of Zoology, University of Manitoba, and Mr. J. B. Skaptason, Chief Inspector of Fisheries, for their reading and helpful criticism of the manuscript, and also to Mr. A. G. Cunningham, Director of Game and Fisheries, under whose direction the work was completed.

Grateful acknowledgment is made to the United States National Museum for permission to use illustrations from Jordan & Evermann's "Fishes of North and Middle America." Unless otherwise marked, all illustrations in the text are from this source.

TABLE OF CONTENTS

Page

Foreword ..... (i)

Preface ..... (iii)

The Fishes—Body Structure and Function 1

Classification of Fishes 10

The Identification of Fishes 11

Key to the Families 12

- Lampreys, Family Petromyzonidae 14
- Sturgeon, Family Acipenseridae 15
- Bowfin, Family Amiidae 18
- Goldeye-Mooneye, Family Hiodontidae 19
- Salmons, Trouts and Charrs, Family Salmonidae 22
- Whitefishes and Tullibees, Family Coregonidae 26
- Graylings, Family Thymallidae 35
- Suckers, Family Catostomidae 36
- Minnows, Family Cyprinidae 43
- Catfishes, Family Ameiuridae 58
- Pikes, Family Esocidae 62
- Mudfishes, Family Umbridae 64
- Trout Perches, Family Percopsidae 65
- Perches, Family Percidae 67
- Darters, Sub. Family Etheostomidae 71
- Basses, Family Centrarchidae 74
- Drums, Family Sciaenidae 79
- Sculpins, Family Cottidae 81
- Sticklebacks, Family Gasterosteidae 82
- Codfishes, Family Gadidae 84

Distribution and Abundance 87

Geology 87

Topography 89

Physical and Chemical Factors 89

Biological Factors 91

Index 95

Glossary of Technical Terms 99

Literature 101

LIST OF ILLUSTRATIONS, CHARTS AND MAPS

Page

Typical Fish, etc. 2
Heads of Fish 4
Internal Organs of a Fish 6
Chestnut Lamprey—*Ichthyomyzon castaneus* 14
Lake Sturgeon—*Acipenser fulvescens* 15
Pigeon River 16
Bowfin—*Amia calva* 18
Goldeye—*Amphiodon alosoides* 20
Mooneye—*Hiodon tergisus* 21
Lake Trout—*Cristivomer namaycush* 22
Arctic Charr—*Salvelinus alpinus* 24
Brook Trout—*Salvelinus fontinalis* 25
Black-fin Tullibee—*Leucichthys nigripinnis* 28
Lake Herring—*Leucichthys artedi* 29
Tagging Whitefish 30
Common Whitefish—*Coregonus clupeaformis* 31
Female Whitefish yields eggs, etc. 32
Round Whitefish—*Prosopium cylindraceum quadrilaterale* 34
Arctic Grayling—*Thymallus signifer* 35
Largemouth Buffalofish—*Megastomatobus cyprinella* 38
Smallmouth Buffalofish—*Ictiobus bubalus* 38
Quillback Sucker—*Carpiodes cyprinus* 39
Northern Sucker—*Catostomus catostomus* 40
Common Sucker—*Catostomus commersonnii* 40
Hog Sucker—*Hypentelium nigricans* 41
Greater Redhorse—*Moxostoma rubreques* 41
Silver Redhorse—*Moxostoma anisurum* 42
Northern Redhorse—*Moxostoma aureolum* 42
Chub Sucker—*Erimyzon sucetta* 43
Carp—*Cyprinus carpio* 46
Stone Roller—*Campostoma anomalum* 47
Fathead Minnow—*Pimephales promelas* 47
Bluntnose Minnow—*Hyborhynchus notatus* 48
Red-belly Dace—*Chrosomus eos* 49
Golden Shiner—*Notemigonus crysoleucas* 49
Spot-tail Minnow—*Notropis hudsonius* 51
Lake Shiner—*Notropis atherinoides* 51
Rosey-face Minnow—*Notropis rubellus* 52
Common Shiner—*Notropis cornutus* 52
Blacknose Shiner—*Notropis heterolepis* 53
Mimic Shiner—*Notropis volucellus* 53
River Shiner—*Notropis blennius* 54
Red-fin Minnow—*Notropis umbratilis* 54
Long-nose Dace—*Rhinichthys cataractae* 55
Black-nose Dace—*Rhinichthys atratulus* 55

Page

Lake Chub—*Couesius plumbeus* ... 56
Hornyhead Chub—*Nocomis biguttatus* ... 56
Creek Chub—*Semotilus atromaculatus* ... 57
Flathead Chub—*Platygobio gracilis* ... 57
Channel Cat—*Ictalurus lacustris* ... 58
Bullhead—*Ameiurus nebulosus* ... 60
Madtom—*Schilbeodes gyrinus* ... 61
Stone Cat—*Noturus flavus* ... 62
Common Pike—*Esox lucius* ... 63
Muskallunge—*Esox masquinongy* ... 64
Mudminnow—*Umbra limi* ... 65
Trout Perch—*Percopsis omiscomaycus* ... 65
Three thousand parent pickerel ready to participate in the spring spawning, etc ... 66
Yellow Pike Perch—*Stizostedion vitreum* ... 68
Sauger—*Stizostedion canadense* ... 69
Yellow Perch—*Perca flavescens* ... 70
Log Perch—*Percina caprodes* ... 72
Black Sided Darter—*Hadropterus maculatus* ... 72
Iowa Darter—*Poecilichthys exilis* ... 73
Johnny Darter—*Boleosoma nigrum* ... 73
River Darter—*Imostoma shumardi* ... 73
Calico Bass—*Pomoxis nigro-maculatus* ... 74
Rock Bass—*Ambloplites rupestris* ... 75
The biologist surveys the smallmouth black bass ... 76
Smallmouth Black Bass—*Micropterus dolomieu* ... 77
Largemouth Black Bass—*Huro salmoides* ... 79
Sheepshead—*Aplodinotus grunniens* ... 80
Slimy Muddler—*Cottus cognatus* ... 81
Millers Thumb—*Cottus bairdii* ... 82
Brook Stickleback—*Eucalia inconstans* ... 83
Ninespine Stickleback—*Pungitius pungitius* ... 83
Threespine Stickleback—*Gasterosteus aculeatus* ... 84
Burbot—*Lota lota maculusa* ... 85
Arctic Cod—*Boreogadus saida* ... 86
Harvesting "Selkirk Whitefish" ... 86
Map of the distribution of the sturgeon ... 88
Map of the distribution of the goldeye ... 88
Map of the distribution of the grayling and brook trout ... 90
Map of the distribution of the basses ... 90
Map of the world distribution of the pike ... 92

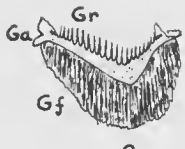
THE FISHES—BODY STRUCTURE AND FUNCTION

A general knowledge of fishes and how they "live, move and have their being" is an obvious prerequisite to the serious study of any particular group and, in any case, may be of interest before proceeding to a detailed consideration of the fishes of this province.

First of all, what is a fish? The popular definition of "an animal that lives in the water" is not satisfactory, for this includes whales and porpoises, clams and snails, and hosts of minute organisms, none of which are true fish. Strictly defined, a fish is "a cold-blooded, backboned, aquatic animal having gills throughout life and with the limbs, if any, modified to form fins." With this definition in mind, then, let us review briefly the more important features and activities of a fish.

Body Shape.—The ideal fish shape is that of a torpedo, or, more accurately, a torpedo or a modern aeroplane is fish-shaped, for the fish had perfected "stream-lining" long before designers incorporated these principles into machines. This shape can, by simple experiments, be shown to be the most efficient in cleaving a resistant medium such as water. Not all fish possess this shape, for under the stress of certain conditions some species have become almost round, others compressed (flattened from side to side), or depressed (flattened from above downward). The majority of local fishes are either torpedo-shaped or compressed.

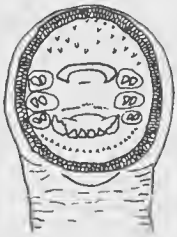
Body Covering.—Covering the body of a fish is a layer of skin which differs radically from that of land animals in that it is composed entirely of living cells. Embedded in this skin, in the majority of fishes, are thin plates of bony and fibrous materials known as scales. When first hatched, fish are scaleless, but early in the first year of life the rudiments of scales appear beneath the outer layer of skin and grow outward until eventually the body is completely covered by scales arranged something like the shingles on a roof. As the fish grows in size it does not produce more scales to cover the greater area of body surface, but instead each scale increases in size to keep pace with the portion of the body it originally covered. Growth of the outer or bony surface of the scale is brought about by addition to the outer margin of successive rings of scale substance. In summer, when food is abundant, growth is rapid and a number of widely spaced rings will be formed on the scales, but in winter



2.

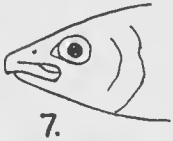
3.

4.

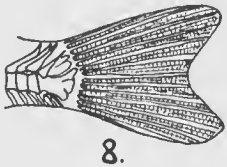


5.

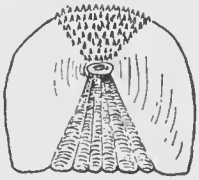
6.



7.



8.



9.

10.

Fig. 1—Typical fish showing main external features: A, adipose fin; An, anal fin; C, caudal fin; D, dorsal fin; LL, lateral line; P, pectoral fin; V, ventral fin.

Fig. 2—Gill of fish: Ga, gill-arch; Gf, gill filaments; Gr, gill-rakers.

Fig. 3—Heterocercal tail.
Fig. 4—Pharyngeal teeth.
Fig. 5—Sucking mouth of lamprey.
Fig. 6—Terminal mouth.
Fig. 7—Inferior mouth.
Fig. 8—Homocercal tail.
Fig. 9—Ctenoid scale.
Fig. 10—Cycloid scale.

growth slows down or stops and the rings added at that time are few and placed closely together. For this reason the scales of a fish are of inestimable value to the biologist because, by counting these groups of rings under the microscope, the exact age of the fish can be determined.

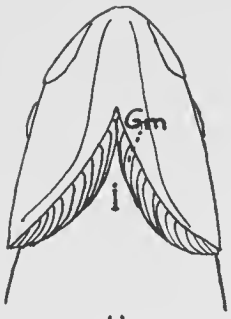
The scales of local fishes are of two general types, known as "cycloid" and "ctenoid." Fishes such as the whitefish and suckers have cycloid scales which are fairly soft and round, and the portion which is exposed on the surface is smooth (Fig. 10). Perch and bass, on the other hand, have harder scales and the exposed surface is armed with minute spines. These are ctenoid or "comb-like" scales (Fig. 9).

In addition to the skin and scales, a fish has a coating of mucus or slime which is produced by glands of the skin. This slime serves several purposes. It reduces friction and allows the fish to slide through the water easily and, more importantly, protects the fish from the attacks of fungi, bacteria and other parasites. Accordingly, if it is desired to handle fish without harming them, wet hands or wet gloves on the hands must be used, for if much of the slime is removed the spores of fungi and bacteria, always present in the water, will soon invade the exposed area of skin.

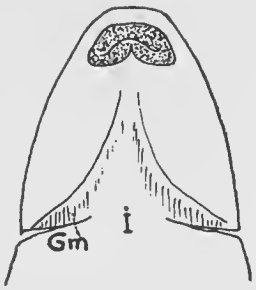
The slime varies in amount with different fish, and it also has a very characteristic odour. With a little practice it is possible to identify most of the common fishes merely by the smell.

Coloration.—Although it is not generally recognized, fishes as a group have a greater variety of pattern and colour than the most brilliant birds. Only in tropical waters, however, are the vivid hues found, and most fishes of temperate or northern waters are comparatively drab. A fish owes its coloration to masses of tiny pigment cells in the skin which contain waste products of various sorts and colours. The pearly or silvery sheen of most fishes, particularly brilliant in those which live a free-swimming life, is due chiefly to crystals of a substance known as "guanin." (This guanin can, by fairly simple methods, be extracted from the skin and is now widely used for making artificial pearls and iridescent lacquers.) The other colours of a fish are contained in branching cells known as "chromatophores," which means simply "colour bearers." These cells have the power to contract or expand, thus concentrating or diffusing the contained pigment and causing a pronounced colour change.

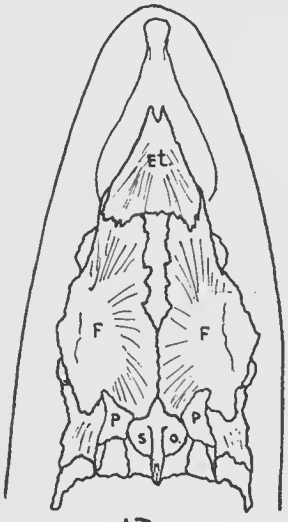
The ability to change colour varies with different species, but is possessed in some degree by all. The colour-changing mechanism



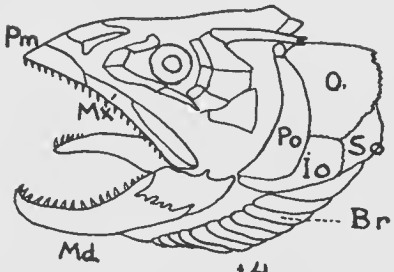
11.



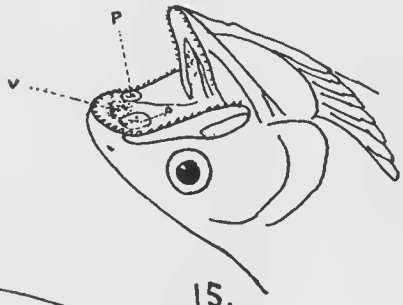
12.



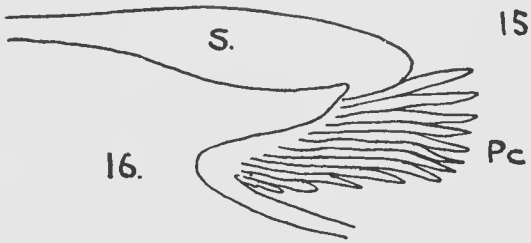
13.



14.



15.



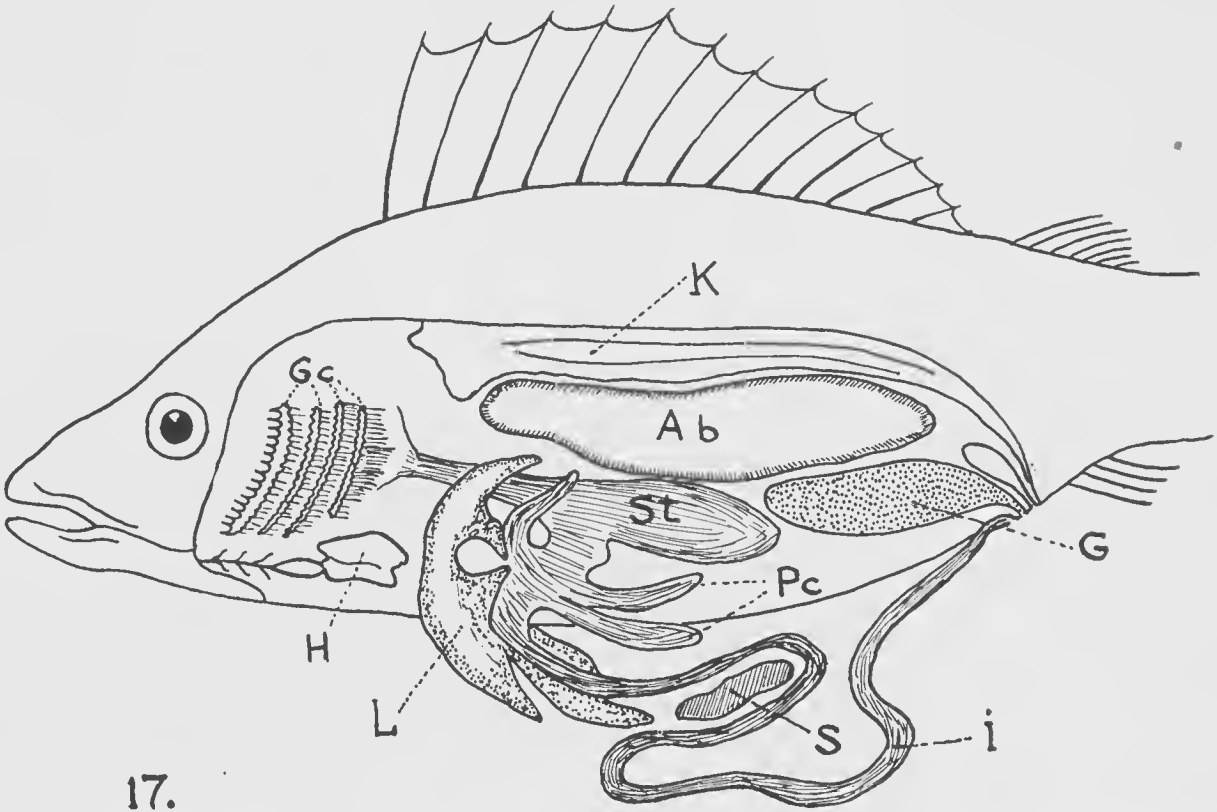
16.

Fig. 11—Lower surface of head of pike-perch: I, isthmus; Gm, gill-membrane.
Fig. 12—Lower surface of head of sucker: I, isthmus; Gm, gill-membrane.
Fig. 13—Bones of skull: Et, ethmoid; F, frontal; P, parietal; So, supra-occipital.
Fig. 14—Bones of head: Pm, premaxilla; Mx, maxilla; Md, mandible; Po, preoperculum; O, operculum; Io, interoperculum; So, sub-operculum; Br, branchiostegal ray.
Fig. 15—Head of fish showing roof of mouth: V, vomer; P, palatines.
Fig. 16—Stomach of fish: S, stomach; Pc, pyloric caeca.

of the chromatophores is directly controlled by the nervous system, and a fish not only alters its colour to blend with its environment, but may change almost instantaneously under the influence of fear or shock. For these reasons very little attention has been paid to colour in the keys and descriptions of Manitoba fishes, as identifications based on this feature are of little value.

Fins.—The fins of fish are thin folds of skin supported by bony rays. The rays may be jointed and soft or hard and solid, these latter forming the sharp spines of many fishes. Typically there are two pairs of matched fins and three unpaired fins. The paired fins are the pectorals (Fig. 1, P) located usually just behind the gill openings and the pelvics or ventrals (Fig. 1, V) located on the lower side of the body. These correspond to the fore and hind limbs of a land animal and in some bottom dwelling fishes are actually modified to form organs of locomotion. In most fish, however, they function chiefly as steering and balancing mechanisms. The unpaired or vertical fins are the dorsal (Fig. 1, D) located in the mid-line of the back, the anal (Fig. 1, An) on the lower surface and the caudal or tail fin (Fig. 1, C). The dorsal and anal fins function like the keel of a boat to prevent rolling, but they may also be armed with spines for offence or defence. The caudal or tail fin gives added power to the lashing movements of the body by means of which the fish swims.

Feeding and Digestion.—Like other animals, a fish is fundamentally a mechanism for the conversion of food into energy, and is, therefore, equipped with means of obtaining food and of breaking this down into substances which can be utilized. The mouth, used in obtaining food, varies considerably in shape, position and armament. Carnivorous fishes, such as the pike, have a mouth equipped with strong, recurved teeth which are constantly replaced as they become worn. Such fish make no attempt to masticate food, but bolt it whole. Fishes such as the tullibees have no teeth in the mouth, but on the inner surfaces of the gill arches are numerous fine, bony processes (Fig. 2, Gr) which interlock and form an efficient strainer for the minute organisms or "plankton" on which the fish feeds. Fishes like the sheepshead, which feed principally upon hard-shelled clams and crustaceans, possess pharyngeal or throat teeth in the form of flat, crushing plates controlled by powerful muscles. Many fish have structures about the mouth which aid in securing food. The long barbels of the catfishes and sturgeon and the sensitive, fleshy lips of the suckers are examples of these.



17.

Fig. 17—The internal organs of a fish: Ab, air-bladder; G, gonad; Gc, gill-clefts; H, heart; I, intestine; K, kidney; L, liver; Pc, pyloric caeca; St, stomach; S, spleen.

The digestive system proper (Fig. 17) consists of stomach, intestine and certain associated organs. In connection with the stomach, there are usually structures peculiar to fishes known as pyloric caeca (Fig. 16, Pc). Some fish lack these, but the majority have from one to several hundred. The caeca are finger-like pouches which secrete powerful digestive juices. The absorptive region or intestine, also the liver, pancreas and spleen are similar in appearance and function to those of a land animal.

The kidneys are very long paired organs which are closely applied to the roof of the abdominal cavity on either side of the backbone. These eliminate the liquid waste products of metabolism.

The Air-bladder.—The air-bladder (Fig. 17, Ab) is a membranous, gas-filled sac which lies against the roof of the abdominal cavity. All its functions are not yet understood, but it is known to act as a float or hydrostatic organ, a reservoir for oxygen, an accessory to the hearing system and a sound producing mechanism. Some fishes lack it altogether.

Breathing.—Like all animals, a fish must constantly take in oxygen and liberate the waste product, carbon dioxide. In land animals air is taken into the lungs, where the oxygen is extracted and carbon dioxide liberated. In a fish this interchange of gases takes place through the structures known as gills. The gills of a fish consist of a multitude of delicate filaments arranged along four bony arches separated by clefts (Fig. 17, Gc). Minute blood vessels connect with each filament, and through their thin walls carbon dioxide passes out and oxygen enters.

The oxygen used by a fish is not that which forms a chemical part of the water, but merely that which is dissolved in the water. Compared with air, which contains over 200 parts per thousand of oxygen, water can hold only small quantities of the gas. Depending on the temperature, water becomes saturated by from seven to fifteen parts per million. For most fishes 50 to 75 per cent saturation is sufficient, however, and only when the oxygen becomes almost completely depleted by heavy ice cover or pollution do all fish die of asphyxiation.

To breathe, then, a fish first closes its gill-covers, opens its mouth and sucks in water by an expansion of the "cheeks." The mouth is then closed, the cheeks contracted and the water forced through the gill-clefts and out of the gill-openings, the interchange of gases being effected during the passage of water over the gill-filaments.

The rapidity of these movements varies from twelve per minute in some fish to as much as 150 per minute in others.

Although commercial fishermen speak of "drowned" fish in their nets, it is obviously impossible for a fish to drown in the same sense that a land animal does. What happens to fish which die in nets is that the twine obstructs the movements of the mouth or gill-covers and so prevents the free flow of water through the gill-openings.

Circulation.—To convey food substances and oxygen to the various body tissues and to eliminate the wastes, there must be a circulatory system. In a fish, as in other animals, this consists of a pump or heart, a series of channels, the veins and arteries and the circulating fluid or blood. Fish are "cold-blooded" animals, which means that their body temperature is only slightly above that of the water in which they live and fluctuates in accordance with changes in outside temperature. The circulation of blood is, therefore, comparatively slow and inefficient, and the heart, instead of being the complex mechanism of a land animal, is a simple two-chambered muscular sac located far forward in the throat region (Fig. 17, H). Impure blood collected by the veins from the body tissues flows to the heart and is pumped forward to the gills for purification. From the gills it passes to the arteries, through which it directly reaches the body tissues, later returning to the heart through the veins.

Reproduction.—The reproductive organs of fishes (Fig. 17, G)—testes in the male, ovaries in the female—are long, paired tubes which lie on either side of and above the digestive organs and open through a genital aperture close to the anus. The testes produce countless billions of the microscopic fertilizing elements known as spermatozoa, while in the ovaries develop a varying number of eggs. Some fishes which guard their eggs after deposition produce only a few hundred, but others, which show no parental solicitude, may deposit many thousands or even millions of eggs. No matter how many eggs are spawned by a single fish, the mortality occurring in the eggs and the young fish is so great that, on the average, no more than two of the eggs ever produce individuals which succeed in spawning.

The manner in which the spermatozoa are brought in contact with the eggs varies greatly amongst different species. In certain sharks both fertilization and development of the egg is internal; in other fishes fertilization is internal but development external; while in the majority, which include all local fishes, both female and male

sex-products are shed into the water and the fertilized eggs sink amongst the gravel or debris of the bottom to undergo incubation.

Some fish "pair-up" during the mating season, but in other species several males may co-operate in fertilizing the eggs of every female, while a single male of other species may fertilize the eggs of several females.

Fish such as the Pacific salmon breed once and then die, but most fishes spawn annually after sexual maturity has been attained. Certain small tropical fishes are capable of producing additions to their families every few weeks or even days, but fish like the sturgeon rest several years between spawnings.

Fishes which spawn annually are of two general types. Members of the trout and whitefish families deposit their eggs in the autumn and the incubation period lasts for many weeks, or even months. All other local fishes spawn in the spring or early summer, and the fry emerge from the eggs in a few days or weeks at most.

Nervous System and Sense Organs.—A fish has a nervous system built on a plan similar to that of a human being, but much lower in its organization. The brain, enclosed in the bones of the skull, is very small and poorly developed in those regions which, in man, are concerned with reason and the so-called higher abilities. Running backward through the vertebral column is the spinal cord from which extend nerves to all parts of the body.

The eyes of most fishes are fairly well developed, but are adapted only for sight at short distances.

A fish has no external ears, yet it does possess paired structures somewhat similar to our own inner ears. These are organs of equilibrium and, in some species at least, function as true organs of hearing, though the range of vibrations which are audible as "sounds" is apparently much smaller than in the case of the human ear. In addition, the fish has an auxiliary hearing organ in the lateral line system. The lateral line (Fig. 1, LL), which can be seen along either side of the body in most fish, marks the position of a nerve and its associated endings which conveys to the brain low-frequency vibrations such as those caused by the passage of another fish through the water. The lateral line system also functions as a heat-receptor and serves to warn the fish of too-sudden changes in temperature.

The sense of smell is very strongly developed in some fishes. The actual sensory organs are, like our own, located in the nostrils, but the nostrils do not connect with the throat. The nasal openings

are located on the snout and are protected by little flaps of skin. In most fishes each nostril has a double opening, and water carrying the odours is moved into one opening and out the other by the action of tiny beating hairs or "cilia." The sense of smell is most acute in those fishes, like the catfish, in which the sense of sight is poorly developed.

CLASSIFICATION OF FISHES

In dealing with the 20,000 or so different kinds of fishes now known, some system or orderly arrangement is necessary to avoid hopeless confusion. Accordingly, all fishes which, apart from individual variations, are identical are grouped as a "species." Closely related species are placed in divisions termed "genera," and similar genera are grouped into "families."

There exists amongst laymen an unfortunate prejudice against the "jaw-breaking" scientific names which have been assigned to these various groups, but it must be pointed out that without them the student very soon becomes lost in a positive welter of common names. The same fish may be known by five or six different common names, even within such a comparatively small area as Manitoba. The fish usually called the sheepshead, for example, is known as "silver-bass," "black-bass," "sunfish" or "buffalo fish," depending upon where in the province it is taken. In the case of fishes whose distribution is cosmopolitan, the total number of common names may become staggering.

One of the most notorious examples of the confusion which may arise through the use of common names is in the case of two fish which occur in local waters. The fish called "pike" or "jackfish" in Manitoba is termed "pickerel" by American sportsmen, while our "pickerel" is called "wall-eyed pike" by Americans! To avoid all this there has, by international agreement, been assigned to every species a latinized name which indicates this particular form and no other, whether it be found in Canada or in any other part of the world. This name, when written in full, shows the genus, the species and the name of the author who first described or recorded the fish. Thus, the full name of the pike would be written *Esox lucius* Linnaeus, and of our "pickerel" *Stizostedion vitreum* (Mitchill).

Many of the specific names of fishes are not mere meaningless conglomerations of syllables but, derived as they are from Greek or Latin roots, point out some particular feature of the fish. Thus, "tergisus," the specific name of the mooneye, means "polished,"

and refers aptly to the shining appearance of the fish. Similarly, "flavescens"—meaning "yellow"—is very descriptive of the perch.

So, for the above reasons, in the following pages each fish discussed is designated by its accepted common name plus its full scientific name and in brackets are shown less-valid common names and, where possible, a free translation of the specific name. The nomenclature adopted is that of Hubbs and Lagler (1941).

THE IDENTIFICATION OF FISHES

The correct identification of a specimen is, necessarily, the first step in its further study. Most fishermen can identify perhaps a dozen or so of the more common species, but are quite lost when confronted by the less familiar forms in Manitoba. We have heard people say that all fish look alike to them, and, while it is undeniably true that all fishes have certain features in common, the specific differences are more pronounced than the differences between human individuals—and no normal person has difficulty in recognizing his friends. Similarly, once familiarity has been acquired, it is possible to recognize the various species of fish at a glance and without the analysis of every feature. Until such familiarity has been gained however, it is necessary to examine the specimen in a little more detail and to employ what is known as a "key." A key, broadly defined, is a tabulation of those characteristics which most reliably distinguish the species in such a way that, by a process of elimination, the correct identification can be learned. The key to the families of fishes on page 12 is arranged on the "alternative" system, which means that one of several contrasted statements will be true of the specimen under consideration, and that these true statements are to be followed down until eventually one which is concluded by a name is reached. This is the family name of the specimen. For example, with a specimen in hand, commence reading the paragraph under the heading "A." This paragraph is concluded by a name, so, if the statements are true, the specimen must be a lamprey. If not true, proceed to the alternative statement under the heading "AA." If this is true of your specimen, read the first subdivision under "AA," which is "B," and so on. Whenever a false statement is reached look for the alternative under the heading of a double or sometimes a triple letter. When the correct alternative is found proceed, if necessary, to the next single letter, until eventually the paragraph concluded by the correct family name is reached. After

each family name there is a page reference which indicates the part of the text devoted to this family. Under family headings there are, where necessary, other keys which, used in the same way as the above, make possible the exact identification of specimens.

This may seem a little confusing at first, but, if familiar specimens are used to practise with, the use of the keys becomes very simple.

Throughout the keys and text there may be found certain terms which are not familiar to the reader. Although their use has been cut to a minimum, some such technical terms are unavoidable in referring to the anatomical features which are used in identification. The glossary on page 95 and the diagrams on pages 2, 4 and 6 will be of value in solving any difficulties in this connection.

KEY TO THE FAMILIES OF FISHES OF MANITOBA

A. (Class Marsipobranchii.)
Mouth a sucking disc without jaws (Fig. 5). External gill-openings seven on each side. Body eel-shaped; paired fins absent.
.....The Lampreys. Family PETROMYZONIDAE (page 14).

AA. (Class Pisces.)
Mouth formed by upper and lower jaws. External gill-openings one on each side; the gills covered by a bony flap or operculum.

B. Caudal fin heterocercal or abbreviate heterocercal (Fig. 3).

C. Body covered with five series of bony bucklers; mouth inferior, snout conical. Four barbels in front of the mouth.
.....The Sturgeons. Family ACIPENSERIDAE (page 15).

CC. Body covered with polygono-cycloid scales. Dorsal fin long (about 50 rays). A dark spot at the base of upper caudal rays in males.
.....The Bowfin. Family AMIIDAE (page 18).

BB. Caudal fin homocercal (Fig. 8) or nearly so; body naked or covered with scales or prickles.

D. Dorsal fin soft (without sharp spine); body scaled.

E. A barbel present at tip of lower jaw. Scales very small, embedded and almost invisible to the naked eye.
.....The Codfishes. Family GADIDAE (page 84).

EE. No barbels at the tip of the lower jaw.

F. Head scaleless.

G. Gill-membranes free from the isthmus (Fig. 11), i.e., split far forward and meeting in an acute angle.

H. Adipose fin absent.
.....The Goldeyes. Family HIODONTIDAE (page 19).

HH. Adipose fin present.

J. Maxillary extending to posterior edge of eye, dentition strong, more than 114 rows of scales on side of body.
The Trouts and Charrs. Family SALMONIDAE (page 22).

JJ. Maxillary not extending behind the eye; teeth absent or weak, less than 101 rows of scales on side of body.

K. Dorsal fin very high and long, with coloured spots. The number of branched rays in dorsal more than 17.
....The Graylings. Family THYMALLIDAE (page 35).

KK. Dorsal fin of moderate size, with fewer than 17 branched rays.
....The Whitefishes. Family COREGONIDAE (page 26).

GG. Gill-membranes joined to isthmus (Fig. 12), not meeting in an acute angle.

L. Pharyngeal teeth numerous and comb-like, mouth fitted for sucking; the lips thick and plicate or papillose.
....The Suckers. Family CATOSTOMIDAE (page 36).

LL. Pharyngeal teeth fewer than eight on each side, the lips thin and never plicate or papillose.
.....The Minnows. Family CYPRINIDAE (page 43).

FF. Head scaled.

M. Jaws flattened (like a duck's bill). Lateral line present.
.....The Pikes. Family ESOCIDAE (page 62).

MM. Jaws not flattened. Lateral line absent, small fishes.
....The Mud-fishes. Family UMBRIDAE (page 64).

DD. Dorsal fin with one spine; body scaleless; adipose fin present; head with long barbels.....The Catfishes. Family AMEIURIDAE (page 58).

DDD. Dorsal fin with more than one spine (except in Trout Perch).

N. Body covered with scales.

O. Adipose fin present. Small fish. (page 65).
.....The Trout Perch. Family PERCOPSIDAE.

OO. Adipose fin absent. More than two sharp dorsal spines.

P. Two dorsal fins.
....The Perches. Family PERCIDAE (page 67).

PP. One confluent dorsal fin.

Q. Three or more anal spines; lateral line not extended across caudal fin. (page 74).
The Basses. Family CENTRARCHIDAE.

QQ. Two anal spines, second one very strong; lateral line extending across caudal fin.
The Drums. Family SCIAENIDAE (page 79).

NN. Body scaleless, but covered with a few prickles; pelvic fins with not more than four soft rays.
....The Sculpins. Family COTTIDAE (page 81).

NNN. Dorsal spines isolated; body naked or covered by bony plates. Small fish. (page 82).
The Sticklebacks. Family GASTEROSTEIDAE.

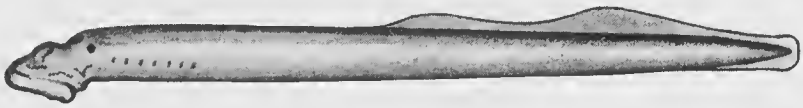
THE LAMPREYS. Family PETROMYZONIDAE

The members of this family are placed in a class (Marsipobranchii) separated from the true fishes. They are characterized by an imperfectly developed skull, lack of jaws, paired fins or ribs and have purse-shaped gills which open externally through seven holes. The mouth is surrounded by a circular sucking apparatus beset with horny teeth.

There are some eight species recorded from both fresh and salt water in North America, but only one is definitely known to occur in Manitoba.

Chestnut Lamprey. *Ichthyomyzon castaneus* Girard

(River lamprey; lamper-eel)
(Castanea = a chestnut)



(Original drawing, J. A. McLeod)

Distribution.—This lamprey is found in the interior lowlands from Western Manitoba to Georgia, Louisiana and eastern Oklahoma. It has sometimes been recorded under the name *concolor*.

In Manitoba it is found most commonly in the larger rivers of the southern portion of the province, and is particularly abundant in the Winnipeg River.

Food and Growth.—The lamprey is essentially parasitic upon other fishes, to which it attaches itself by means of the sucking disc and rasps through the skin and feeds upon the blood and flesh. Smooth-skinned fishes such as sturgeons and catfishes are most frequently attacked, but lampreys are also found on the scaly fishes, usually on a naked portion of the body.

The maximum length attained is about twelve inches.

Breeding.—The lamprey ascends small streams in the spring to deposit its eggs. The young larvae, which are called *Ammocoetes*, differ greatly from the adults. The eyes are deeply buried beneath the skin and the mouth is not circular nor armed with teeth. These larvae burrow about in the mud and feed upon minute organic particles for an indefinite period, but eventually undergo bodily changes and assume the adult condition.

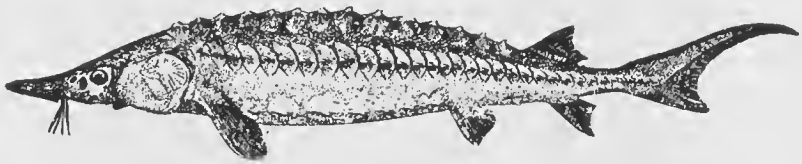
Value.—In Europe the lamprey is valued as food, but in this country is not utilized. It is definitely detrimental in waters where it is very abundant, as other fish may be killed outright by its attacks or be so wounded and weakened that they fall easy prey to disease.

THE STURGEONS. Family ACIPENSERIDAE

The five genera and twenty-three species which constitute this family are widely distributed in the Northern Hemisphere. Some species spend the majority of their lives in salt water, but all must reach fresh water in order to spawn. The skeleton is chiefly cartilaginous. Sturgeons are the largest freshwater fishes in the Northern Hemisphere and specimens of 3,000 pounds weight have been reported from the Caspian Sea.

In North America the family is represented by the shovel-nose sturgeons (*Scaphirhynchus* and *Parascaphirhynchus*) with two species and the true sturgeons (*Acipenser*) with four species. In Manitoba there is but one species—the lake sturgeon *Acipenser fulvescens*.

Lake Sturgeon. *Acipenser fulvescens* Rafinesque.



(From Jordan and Evermann)

Distribution.—The lake sturgeon is still fairly abundant in parts of the lower areas of the Hudson Bay drainage system. It is found in all the large rivers which enter Lake Winnipeg from the east and is very common in the Nelson and Churchill rivers. In Lake Winnipeg it is found amongst the granite rocks of the eastern shore, but is practically absent from the western portions of this lake, and also from Lakes Manitoba and Winnipegosis. Its occurrence during the spring season in the Red and Assiniboine rivers was common at the beginning of the century and is not unknown at the present, as occasionally in spring or early summer sturgeon are taken in the Red River below Lockport.

Food.—As might be inferred from the ventral position of the mouth, the sturgeon is a bottom feeder. The immature stages of

Pigeon River. The typical waterfall of northeastern Manitoba, spawning ground of Sturgeon.
Photo by A. D. Bajkov

the "fish-fly" *(Hexagenia)* is the most important single item of food, but molluscs and crayfish bulk large in the stomach contents. The food of the sturgeon is very similar to that of the whitefish, but as the two species do not in general frequent the same grounds there is little competition between them.

Breeding.—For the purpose of spawning, sturgeon ascend rivers during the latter part of May or early June and seek out stony or gravelly bottoms in about ten feet of water close to rapids or waterfalls. All the large rivers which flow into the eastern side of Lake Winnipeg are visited by sturgeon, but the Winnipeg River near Seven Sisters Falls is probably the most important spawning ground in this region. The stretch of swift water below the dam at Lockport is sometimes used by spawning sturgeon.

Few fish spawn before reaching the age of twenty years, and many not until thirty years old, at which time they are from thirty to forty pounds in weight. After the female has reached the spawning age, the number of eggs increases at each subsequent spawning, until eventually as many as a million eggs may be produced by a single individual. Due to the fact that large females often contain only small unripe eggs at the proper season, it is believed that breeding does not take place every year.

The eggs, which are about 3 mm. in diameter and dark gray in colour, are left unattended after deposition. They hatch in about two weeks or less, depending on the water temperature. The fry frequent shallow bays and eddies along the shore where the current is not too swift.

Growth.—The growth rate of the sturgeon is probably slower than that of other Manitoba fishes. At an age of twenty years, it is approximately three feet in length and twenty pounds in weight. After this, increase in length takes place fairly rapidly, but in weight much more slowly. The largest sturgeon recorded from Lake Winnipeg weighed approximately 275 pounds. It was taken during commercial fishing operations at Rabbit Point on Lake Winnipeg in the summer of 1941. The species has been known to attain a weight of 300 pounds and a length of eight feet. Such large fish are usually females.

Value.—For some years after commercial fishing commenced in Manitoba, the sturgeon had but little value and was destroyed as a nuisance by the fishermen. As the American supplies of this fish were depleted, a demand was created for both the flesh and the eggs in the form of caviar. The sturgeon was then so intensively

fished that by 1927 it was nearing extinction. In this year sturgeon fishing was closed, and remained so for ten years, but since the reopening the very poor catches which have been made indicate that even this period of rest has been insufficient to permit the sturgeon to recover.

Artificial propagation of sturgeon has not met with any outstanding success. In the year 1924, 8,000 fry were successfully hatched in an experiment at Pigeon River, tributary to Lake Winnipeg. It was found that, due to the difficulty of obtaining ripe individuals of both sexes at the proper time, large scale hatchery work would not be practicable.

THE BOWFINS. Family AMIIDAE

This family, which flourished in prehistoric times, is now represented by a single species confined to the fresh waters of North America.

Bowfin. *Amia calva* Linnaeus

(Dogfish; lawyer; grindle)

(From Jordan and Evermann)

Distribution.—The bowfin is of fairly common occurrence in the eastern and central United States, the Upper St. Lawrence and Great Lakes to the head of Lake Huron. It has been reported from the Lake of the Woods area, probably in error, as the record needs confirmation. The common name "lawyer," sometimes applied to the bowfin, leads to confusion, since the same name is also used for the burbot. The name "dogfish" is equally unfortunate, since that name properly belongs to small sharks.

Food and Growth.—This is a savage, well-toothed fish and feeds voraciously upon other fish, crayfish and molluscs. It attains a length of some two and a half feet. It is largely nocturnal in its habits.

Breeding.—The bowfin is one of the nest-building fishes and, as is usually the case, the male fish builds this structure, which may be a rough depression made in the mud amongst the roots of aquatic plants or in gravel. Spawning takes place in the spring, and after this is completed the male fish guards both the eggs and the fry.

Value.—The bowfin is not popular as a food fish, as the flesh is soft and unpleasant when fresh, but it improves with salting and smoking. It is of some importance as a game fish in the eastern United States but is too rare to be of similar value here.

THE MOONEYES. Family HIODONTIDAE

This family contains but three species, which are limited to the fresh waters of North America. In Manitoba there are two species, which may be distinguished as follows:

KEY TO SPECIES

A. Belly coming to a sharp ridge or keel along its entire length; dorsal fin of 9 or 10 fully developed rays, inserted well behind a vertical through anal insertion.
.....Goldeye. *Amphiodon alosoides.*

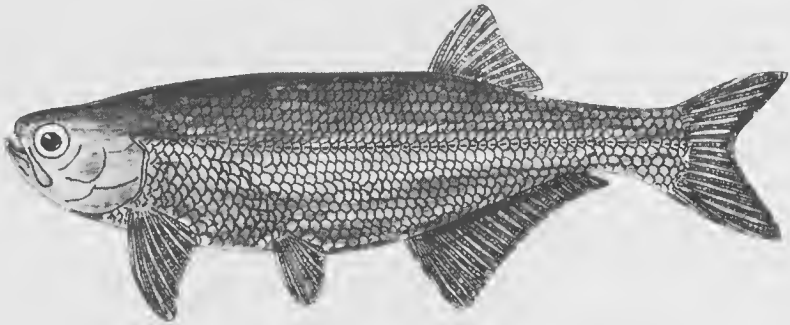
AA. Belly keeled only behind the ventral fins; dorsal fin usually of 12 developed rays, inserted in front of a vertical through anal insertion.
.....Mooneye. *Hiodon tergisus.*

Goldeye. *Amphiodon alosoides* Rafinesque

(Alosoides = shad-like)

Distribution.—The goldeye is distributed from the Ohio River northward, but attains its maximum abundance in Manitoba. Within the province it is found chiefly in lakes Winnipeg, Winnipegosis and Dauphin, but, strangely, it is entirely absent from Lake Manitoba. Certain smaller lakes to the northward and all the larger rivers contain limited numbers of the fish. The northern limit of distribution is not precisely known, but it has been taken in the Nelson River below the Limestone Rapids.

Food and Growth.—The goldeye is, in general, insectivorous in its feeding habits and much of its food consists of terrestrial insects, which are taken from the surface. The aquatic larvae of insects, crustacea and small fish are also eaten. Occasionally small rodents such as voles are found in goldeye stomachs.



Goldeye. Amphiodon alosoides. (Original drawing, A. D. Bajkov)

The average size of the goldeyes from commercial catches is less than a pound in weight and about twelve inches in length, but specimens of twice this weight and some sixteen inches in length have been taken. The average size of this fish from Lake Winnipegosis is slightly greater than that of the Lake Winnipeg goldeye.

Breeding.—Until recently, the breeding habits of the goldeye and, in fact, even the time of spawning were a mystery. It has now been found that the fish ascend rivers and deposit their eggs on gravel or rock shoals during the period between the end of May and the middle of July.

Unlike most other local fish, the goldeye does not spawn every year after scxual maturity has been reached. A certain proportion of the population will, of course, be found to be spawning at the proper period, but others, at the same time, will have only immature eggs. It is this undeveloped condition of the ovaries in certain fish which has been the cause of the mystery which has surrounded the spawning date.

Due to certain anatomical peculiarities, it is not possible to conduct large scale hatchery operations with this fish, and future conservation of the dwindling supply must depend upon limitation of gear, annual catch, etc.

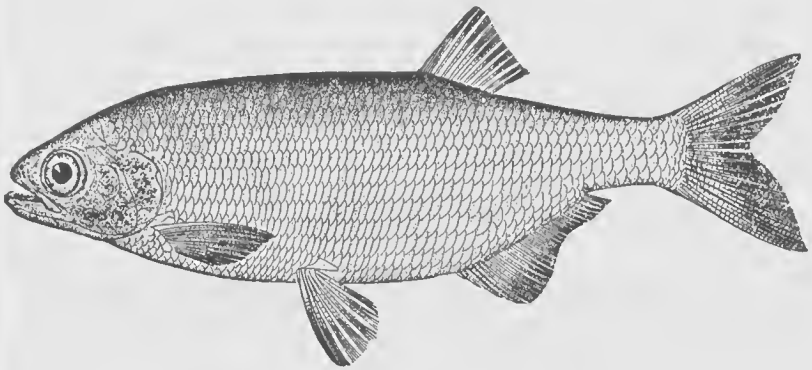
The goldeye and its close relative, the mooneye, are also unusual in that, contrary to the common condition, it is possible to determine the sex of a fish without dissection. In the female fish the lower edge of the anal fin is almost straight, whereas in the male the front portion of this fin forms a large lobe.

Value.—The commercial catch of goldeye is not large, being in the neighbourhood of 300,000 pounds annually. When fresh, the

flesh of the goldeye is rather soft and unattractive, but when smoked and dyed the fish becomes a delicacy which is highly prized both here and in the United States. Although the excellence of this distinctively Manitoban product is widely recognized, it is not so well known that the goldeye is also a fine game fish when taken on light tackle. As it feeds at or near the surface, it will take a dry or wet fly, but perhaps the favourite method of angling is by the use of a small float which supports a hook baited with worm, insect or minnow about a foot below the water surface. The fish is also caught occasionally on small spinners or plugs. On a light fly rod the fight made by a goldeye will satisfy even the most exacting of anglers.

Mooneye. *Hiodon tergisus* Le Sueur

(Tergisus = polished)



(From Jordan and Evermann)

The mooneye ranges farther east than the goldeye and not so far northwesterly. It is common in the lower Great Lakes, whereas the goldeye is not a Great Lakes species.

The food, habits and breeding correspond fairly closely with those of its relative, but the mooneye attains a slightly larger size. Specimens of two pounds and more in weight are not uncommon.

There is no commercial fishery for mooneye, but the majority of fishermen do not distinguish between the two species, and occasionally mooneyes are caught and smoked with goldeyes. As food this species is not so excellent, but as a game fish it is equal or superior to the goldeye. Very good catches are made on the Winnipeg River in July and August.

THE SALMONS, TROUTS AND CHARRS. Family SALMONIDAE

This family includes a large number of valuable species which are found in the waters of the Northern Hemisphere. They are fishes of moderate or large size which inhabit both salt and fresh water. All marine forms, however, return to fresh water to spawn.

Practically every member of this group is of great value as a food and game fish, and, as the eggs are easily handled in hatcheries, the range of many species has been widely extended by artificial means.

The group is, in general, very variable, and the specific identification often presents difficulty even to the expert.

In Manitoba there are but two genera, which can be distinguished as follows:

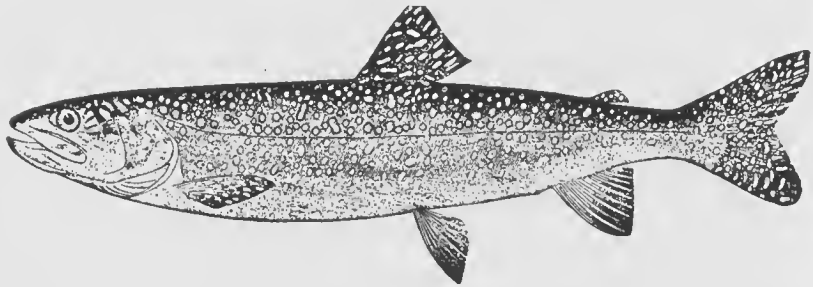
A. Vomer with raised crest which extends backward from the head of the bone and is armed with strong teeth. Coloration dark with grey or silvery spots; never red or black spots. Confined to the deepest lakes.....Lake Trout. *Cristivomer.*

AA. Vomer without raised crest, only the head of the bone toothed. Coloration silvery, unspotted or with yellow or red spots.....Charrs. *Salvelinus.*

Lake Trout. *Cristivomer namaycush* (Walbaum)

(Togue, salmon-trout)

(Namaycush—Indian name for trout)



(From Jordan and Evermann)

Distribution.—The lake trout is the sole representative of its genus and is found throughout the northern part of North America from Labrador to Alaska. It normally inhabits only lakes with a depth greater than fifty feet. It is fairly common in West Hawk and other lakes of the Whiteshell area, and is abundant in many of the deeper lakes north of The Pas. Occasional specimens are taken by commercial fishermen in the northern portion of Lake Winnipeg, but such fish are usually in very poor condition and are believed to be accidental migrants from deeper waters.

Food.—The lake trout is rapacious in its feeding habits and preys chiefly upon tullibee, young whitefish, ling and other deep-water fishes. The larvae of aquatic insects and shore-dwelling minnows are also eaten, particularly during the spring and fall when the fish frequents shallow water.

The colour of the flesh of this fish varies greatly in accordance with its staple food, and even in the same lake specimens with almost white and others with bright red flesh may be taken.

Breeding.—Spawning takes place usually in September or October as the waters become cool. Ripe lake trout eggs are almost a quarter of an inch in diameter, and as many as 20,000 may be produced annually by a large female. These are deposited on rocky or gravelly bottoms in shallow water, and are left unattended throughout the long incubation period. The fry hatch as the water temperature rises in the spring.

During spring and late fall the lake trout frequents the shallow marginal waters of the lakes, and at these times provides superb sport on standard casting tackle. In the summer the fish descends to the deeper waters of its habitat and must then be sought with special deep-water tackle, including two or three hundred feet of copper line. The labour of reeling in this weighty line, combined with the fact that the sudden ascent to the surface greatly weakens the fish, detracts somewhat from the pleasure of summer trout fishing. Large pearl-finished spoons are very effective lures for lake trout. The largest known lake trout taken by angling in Manitoban waters was landed at Lake Athapapuskow. It weighed 60 lbs., and measured 47½ inches in length.

Value.—The lake trout is an important commercial fish throughout its range, and the northern lakes of Manitoba produce some 150,000 pounds annually.

THE CHARRS. Genus *Salvelinus*

KEY TO THE SPECIES

A. Back not marbled with darker colour. Sides silver and immaculate or with light yellow or orange spots the size of the pupil of the eye. Large anadromous fish of Hudson Bay.....Arctic Charr. *Salvelinus alpinus.*

AA. Back prominently marbled with dark olive or black. Blue-circled red spots on sides smaller than pupil of the eye. Freshwater streams and lakes.
.....Brook Trout. *Salvelinus fontinalis.*

Arctic Charr. *Salvelinus alpinus* (Linnaeus)
(Trout, Hudson Bay salmon)

(Original drawing, A. D. Bajkov)

Distribution.—The Arctic species is circumpolar in distribution. It is widely distributed along the western shore of Hudson Bay from the Churchill River northward.

In the lakes of Arctic Canada the fish occurs as a land-locked form, which differs from the sea-run fish in its smaller size and more brilliant coloration.

Food and Growth.—The principal food of the charr is capelin and sandlaunce.

The maximum size attained is a length of three feet and weight of twenty pounds, but such large individuals are rare. The average weight is about seven pounds.

Breeding.—In the late fall charr enter freshwater lakes and spawn under the ice. The adults remain in fresh water until spring.

Due to the fact that many individuals past the age at which sexual maturity normally occurs are found to have undeveloped eggs during the spawning period, it is believed that the charr, like some other salmonids, does not spawn annually.

Values.—Some two hundred miles north of Churchill, where it is particularly abundant, this fish is a very important item in the food of the Eskimos. In the late fall and early winter when ice covers the shallow bays, the charr congregate near the edge of the ice and are taken in large numbers by the natives, who use primitive ivory spoons as bait. Undoubtedly these fish would also bite on the more elaborate lures of the modern angler.

Brook Trout. *Salvelinus fontinalis* (Mitchill)
(Speckled Trout)
(Fontinalis = living in springs)

(Original drawing, A. D. Bajkov)

Note.—It should be pointed out that the name "trout" was incorrectly applied to this fish, due to its close resemblance to the true brook trout of Europe (*Salmo trutta fario*). Strictly speaking, the North American brook trout is a charr.

Distribution.—The brook trout occurs naturally in clear, cold streams in the eastern part of the continent from the Atlantic coast to Manitoba. In this province it is limited to the lower reaches of the Nelson River and its tributaries. As its name implies, it is primarily a fish of small streams, but is often found in lakes.

Food and Growth.—The brook trout is, by choice, insectivorous and thrives upon a diet of aquatic insects and their larvae with a proportion of terrestrial insects. Larger specimens will also feed upon fish to a great extent, even their own young.

The growth and size of the brook trout vary greatly with its habitat. In eastern streams fish of two or three ounces in weight may be sexually mature, and a one-pound fish is considered large. In Manitoban streams fish up to seven pounds in weight have been taken, and three and four-pound specimens are by no means rare.

Spawning.—The size and age at maturity vary greatly, as indicated above, and the number of eggs ranges from 150 to 2,500. These are deposited in the fall in gravel beds, where each fish constructs a shallow trough or "redd." The eggs hatch in the following spring.

Value.—The brook trout is far too well loved by anglers to have a prominent position in commercial catches. It is perhaps the most widely publicized and the most popular freshwater game fish.

In northern Manitoba the Kettle, Weir, Limestone and other rivers contain a large population of trout which are, as yet, "uncivilized" in their tastes and do not display the extreme wariness of those in more intensively fished water. Local residents make large catches of trout with primitive tackle, using raw meat or frogs for bait, but the fish rise well to the more conventional lures. It is found that flies which are predominantly red in colour and of large size are most effective. Large fish are frequently taken on bucktail, frogs, mice and "bass-bugs." As in other waters, the fish are somewhat sporadic in their feeding, and a knowledge of local conditions is necessary for successful fishing.

The comparative inaccessibility of the trout streams is a great disadvantage which possibly may be overcome by the introduction of this valuable species into more southern waters.

INTRODUCED SPECIES

Two species of trout have been introduced into Manitoba, and may in time become fishes of Manitoba.

At Clear Lake in Riding Mountain National Park, rainbow trout—*Salmo irideus* Gibbons—have been planted as fingerlings for the past five years. In recent commercial fishing operations, adult rainbow are reported to have been taken.

At the Whiteshell Trout Hatchery, brown or Loch Leven trout—*Salmo trutta fario* Linnaeus—are being cultured for introduction into suitable Manitoba lakes.

THE WHITEFISHES AND TULLIBEES. Family COREGONIDAE

This family contains many species of freshwater and anadromous fishes which are widely distributed in the boreal regions of the Northern Hemisphere. In Manitoba there are three genera and eight species.

Due to their abundance and excellent flavour, the members of this family occupy a very important position in the fishing industry of this country. Approximately one third of the total catch of freshwater fish in Canada is composed of fish of this group.

KEY TO THE GENERA OF MANITOBA COREGONIDAE

A. Two flaps between the openings of the nostril; exposed area of lateral line scales not less than in other scales.

B. Lower jaw longer than or equal to upper; mouth terminal or superior; gill-rakers more than 32.....The Tullibees. Genus *Leucichthys.*

BB. Upper jaw longer than lower forming a snout; mouth inferior; gill-rakers fewer than 32.....The Whitefishes. Genus *Coregonus.*

AA. One flap between the openings of the nostril; exposed area of lateral line scales much smaller than in other scales; mouth very small; gill-rakers 20 or fewer. .....The Round Whitefish. Genus *Prosopium.*

THE TULLIBEES. Genus *Leucichthys*

(Ciscoes; lake herrings; chubs)

Although commercial fishermen recognized but two types of tullibee—light back and black back—six species are at present recognized in the waters of Manitoba. The separation of these species rests upon various minor differences, principally the number of gill-rakers, and is of little importance to the average fisherman. However, for the benefit of students the following key is provided:

KEY TO SPECIES

A. Gill-rakers 55 or more on first branchial arch.....Black-back Tullibee. *L. nipigon.*

AA. Gill-rakers fewer than 55 on first branchial arch.

B. Gill-rakers 43 to 54 on first branchial arch.

C. Head long, in specimens 10 inches and more in length contained 3.8 to 4 times in length to base of caudal fin. .....Black-fin Tullibee. *L. nigripinnis.*

CC. Head short, 4.1 to 4.4 in length.

D. Body deep.....Tullibee. *L. tullibee.*

DD. Body slender.....Lake Herring. *L. artedi.*

BB. Gill-rakers fewer than 43.

E. Small, thin species; mandible thin, usually with slight hook at end. .....Bloaters. *L. hoyi.*

EE. Larger species; mandible thicker without hook at end. .....Light-back Tullibee. *L. zenithicus.*

Note.—In Lake Winnipeg there are frequently found fish which appear to be intermediate between certain species of tullibee or even between tullibee and whitefish. Since all the species breed in the autumn, hybridization is possible. It is not possible to prove the origin of doubtful specimens, but at Dauphin River Hatchery during the 1937 season whitefish eggs were successfully fertilized with male tullibee, and tullibee eggs with male whitefish.

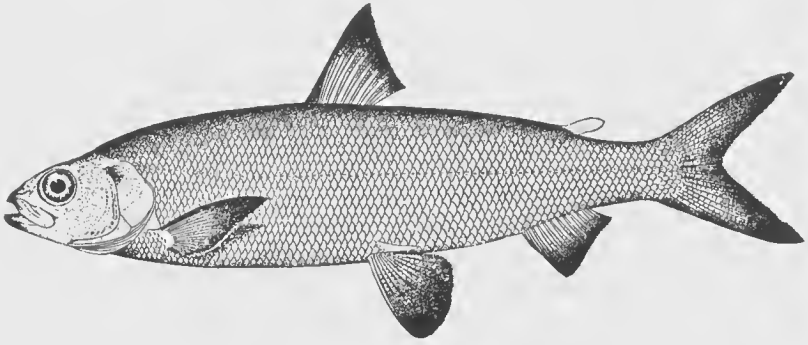
Black-back Tullibee. *Leucichthys nipigon* Koelz
(Nipigon tullibee)

This species has been recorded from Lake Nipigon, certain smaller lakes of Ontario and Lake Winnipeg in Manitoba. It is found chiefly in comparatively shallow water, where it feeds entirely upon plankton. It reaches a weight of two pounds, but is not of outstanding commercial value as its flesh is dry and not so well adapted to smoking as that of other species. Due to its plankton feeding habit, it has no angling value.

Light-back Tullibee. *Leucichthys zenithicus* (Jordan & Evermann)
(Pale-back tullibee, short-jaw chub)

This tullibee is found chiefly in the Great Lakes, Lake Nipigon, Lake of the Woods and Lake Winnipeg. It is a fish of comparatively deep water, and in Lake Winnipeg it is found in large schools, principally along the western side of the lake. Plankton plays a secondary role in its diet as it feeds chiefly upon the same bottom organisms as does the whitefish, with which it is often found associated. In consequence, the flesh is fat and well fitted for smoking and the species has considerable market value.

Black-fin Tullibee. *Leucichthys nigripinnis* (Gill)
(Black-back tullibee)



(From Jordan and Evermann)

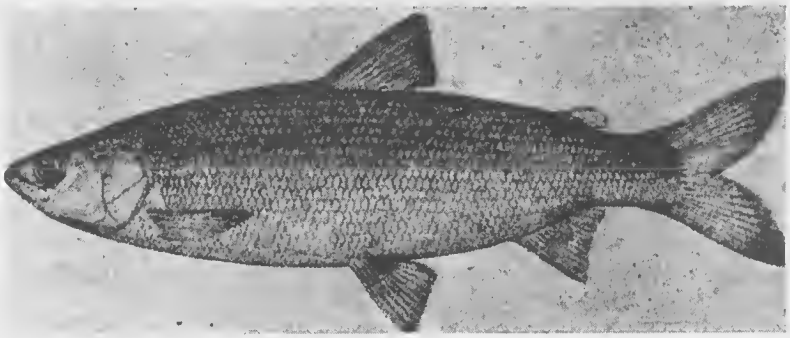
This species is widely distributed in Canada from Lake Huron to Lake Athabasca. In Manitoba it is found chiefly in Lake Winnipeg and certain northern lakes.

Tullibee. *Leucichthys tullibee* (Richardson)

This fish occurs in many of the lakes of the Prairie Provinces from Lake Winnipeg westward. It is a common species, being found in lakes Manitoba, Winnipegosis, Dauphin and others. It is very common in lakes north of The Pas. The food consists of plankton, bottom fauna, and in some lakes, notably Lake Manitoba, of minnows. It sometimes feeds upon insects at the surface and therefore could be taken on the artificial fly, although we have no record of this being done.

In Lake Manitoba the flesh of this species is almost free from larval tapeworms, and the fish from this lake are of considerable commercial value.

Lake Herring. *Leucichthys artedi* (Le Sueur)
(Blue-back tullibee)



(From U.S. Department of the Interior "Fishes of the Middle West")

This fish is very widely distributed throughout all the northern part of the continent. In Manitoba it is found in Lake Winnipeg, Reindeer Lake and other northern waters. It enters brackish waters off the mouths of rivers flowing into Hudson Bay. It is a very variable type and fish ranging in form from slim and elongate to deeper and more compressed are found. The relationship between *tullibee* and *artedi* has not yet been satisfactorily worked out.

Tagging Whitefish with metal tags affixed to the bone of the gill cover. By tagging and releasing live whitefish, the range of this species in Lake Winnipeg has been recorded by the tagged fish recaptured during commercial fishing operations.

Photo by G. E. Butler

Bloater. *Leucichthys hoyi* (Gill)
(Mooneye cisco)

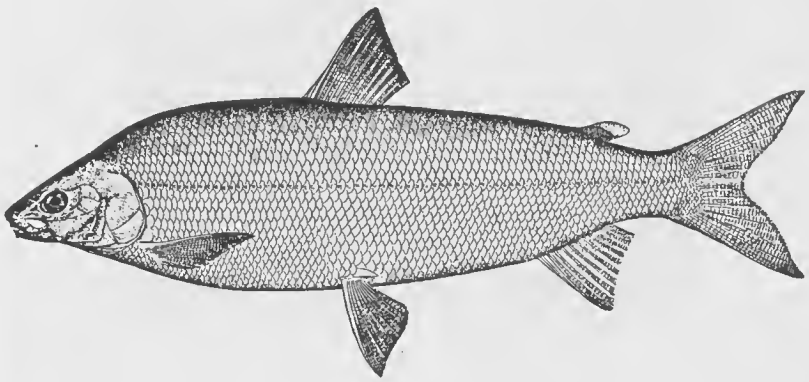
This species, which does not exceed eight inches in length, is found commonly in Lake Winnipeg, but has no economic importance.

Note.—The flesh of some tullibees contains the larval stages of a tapeworm known as *Triaenophorus crassus*. This parasite can reach its adult form only in the intestine of a carnivorous fish such as the pike and is therefore absolutely harmless to warm-blooded animals. However, the cysts which surround the larvae in the flesh are rather unpleasant in appearance and for this reason tullibee from some areas are barred from the markets.

Tullibee, when smoked and dyed, are sometimes sold as the more expensive goldeye. This practice has been largely stopped, but in any event the deception can be detected easily by the fact that the tullibee has a small adipose fin which is absent in the goldeye. Furthermore, the tullibee has no teeth in the mouth, while the goldeye possesses sharp teeth on both jaws and tongue.

THE WHITEFISHES. Genus *Coregonus*

Common Whitefish. *Coregonus clupeaformis* (Mitchill)
(Clupeaformis = herring-like)



(From Jordan and Evermann)

Distribution.—The common whitefish is found in all suitable lakes from the Maritime Provinces to the Northwest Territories. From streams flowing into Hudson Bay it descends to brackish water and

A female Whitefish yields her eggs to the fish hatchery man, even though ice has covered the Dauphin River.
Photo by M. E. Butler

spends considerable time there, but returns to fresh water at spawning time. This anadromous form has been regarded by Bajkov as a distinct species and given the name *Coregonus atikameg*, but it seems likely that the differences in body form, fin lengths, etc., which distinguish it are due to environmental effects. The flesh of the anadromous form is said to be not so rich as that of the freshwater one.

Food and Growth.—During its first year of life the young whitefish feeds chiefly on the minute floating organisms or plankton, but from the second year onward becomes a bottom feeder and lives mainly upon freshwater shrimps, insect larvae (particularly that of the fish-fly *Hexagenia*), and various molluscs. The food of the whitefish varies considerably in different lakes and is reflected by wide variations in the external appearance and quality of the flesh of the fish.

The growth of the whitefish in lakes such as Winnipeg is, roughly, half a pound per year, but in other lakes with a less abundant food supply the rate is much below this. As recently as 1923 fish weighing twenty and twenty-four pounds were reported, but with the extension of the fishing industry such large fish have been practically eliminated. At the present time the average weight of whitefish in commercial catches in Manitoba is approximately two and one-half to three and one-half pounds and the bulk of the fish so caught are six to eight years old.

Breeding.—Whitefish reach sexual maturity at an age of four and one-half years and breed annually thereafter. Spawning commences when the water cools in the fall, October and November being the principal spawning months in this region. The fish gather into large schools and migrate from the deeper parts of the lake to shallower places around reefs or in sizable rivers. These spawning places appear to be more or less constant. The spawning act usually takes place after sunset, and the eggs are deposited in small batches over a period of several days, a habit which gives the eggs a greater chance of survival than if they were all deposited at once. The fish return to deep water immediately after spawning. The average number of eggs per fish is about 35,000, but a large female may contain as many as 150,000. Roughly, the number of eggs is 12,000 per pound of fish.

No parental care is exhibited by the whitefish and, throughout the winter months, the eggs are exposed to the attacks of predators, chief amongst them being the whitefish themselves. The eggs do not hatch until the water commences to warm in the spring, usually April or May.

In the inland fisheries of Canada the whitefish brings more money to fishermen than any other variety of fish. Until recently displaced by pike-perch, and more recently by sauger, whitefish held a similar place in the Manitoba fishery production. Over four million pounds of whitefish are taken annually in the waters of Manitoba, 85 per cent of which came from Lake Winnipeg during the statistical year 1941-42. The fish from this lake are of particularly high quality and, fresh or smoked, command a high price on American markets.

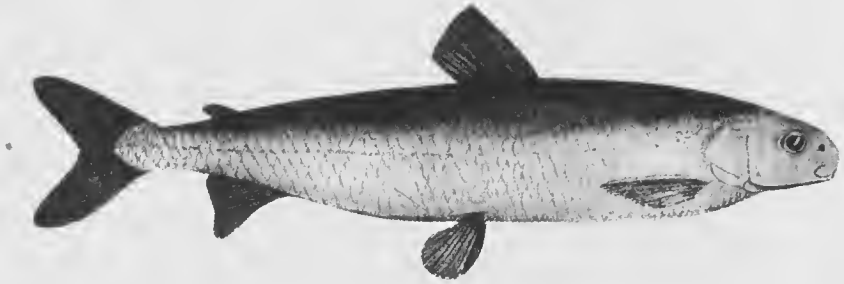
At the present time the Lake Winnipeg whitefish fishery, protected by closed seasons and limitation of gear and annual production and assisted in some degree by artificial propagation, is in a fairly healthy condition. It must be carefully controlled to avoid serious depletion of the whitefish population.

As a sporting fish, the whitefish is of little value. We have no record of a specimen being taken by angling, but it is reported as being taken on small hooks in early spring at Falcon Lake.

Round Whitefish. *Prosopium cylindraceum quadrilaterale* (Richardson)

(Pilot fish; frost fish)

(Quadrilateralis = four-sided)



(From "Manual of Vertibrates of Ontario," C. W. Nash)

The round whitefish is distributed from the Atlantic coast across the northern portion of the continent and extends even into Siberia. In Manitoba it is restricted to the waters in the immediate vicinity of Hudson Bay.

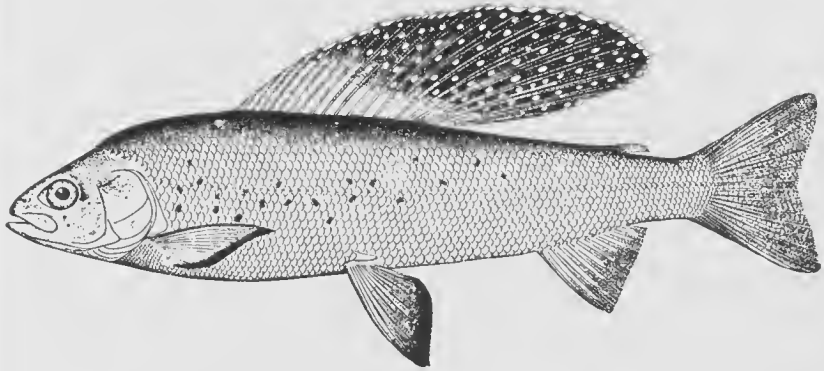
Like other whitefish, it is principally a bottom feeder and breeds in the late fall.

Although its flesh is of good flavour and it will take a baited hook, the round whitefish is of no particular importance at the present time.

THE GRAYLINGS. Family THYMALLIDAE

This family contains one genus with eight species, all of which are fishes of very cold or Arctic regions. In Manitoba there is a single species.

Arctic Grayling. *Thymallus signifer* (Richardson)
(Signifer = standard-bearing)



(From Jordan and Evermann)

Distribution.—The grayling is limited in Manitoba to the extreme northern streams, the Churchill River, its tributaries, and the Owl, Deer and Silcox rivers.

Description.—Although verbal description can convey little of its extremely attractive appearance, few sportsmen are acquainted with this fish, and a brief account may be of interest. The back is nearly black and the sides of lavender or bluish gray with a golden iridescence. A few irregular spots are present on the sides. The head is brown above and shades to lighter on the sides, which like the body, have a violet and golden iridescence. The snout and jaws are black, and there is a blue spot on either side of the lower jaw. The fins are generally gray, but the magnificent dorsal fin which serves to distinguish this fish from all others, and from which it derives its specific name, is unusually striking. It is blackish gray with lighter blotches and numerous blue or violet spots. The upper edge has a bright red band.

Breeding.—The rapids of rivers are used by the Arctic grayling for its spawning grounds. Spawning takes place from May 20th to June 4th in an average season. At the Deer River in June, 1942,

for the first time on record in Manitoba, 100,000 Arctic grayling eggs were taken from parent fish and artificially inseminated.

Value.—The grayling in Manitoba offers new and thrilling sport for anglers. The fish is closely related to the trouts, and resembles them both in its willingness to take the artificial fly and in its fighting ability. A grayling will often leap completely out of the water with all its fins erect when first struck and fights so worthily that great dexterity is required to bring it to net.

In northern Manitoba, August and September are the best months for fishing, and evening the best time of day, although fish will frequently bite ravenously all day in cloudy weather. The fish are usually found in large schools in rapid portions of the rivers.

THE SUCKERS. Family CATOSTOMIDAE

This family includes some fifteen genera and seventy species, which are, with two exceptions in Eastern Asia, confined to the fresh waters of North America.

As the majority of the suckers are very similar in their form, distribution and habits, the following general discussion applies to the whole group:

Distribution.—The suckers are widely distributed in North America, and in Manitoba, due to their toleration of a wide range of conditions, are to be found in abundance in almost every stream and lake, usually in areas of muddy bottom.

Food and Growth.—In accordance with their bottom dwelling habit and inferior mouth, the suckers feed chiefly upon insect larvae, molluscs and crustaceans. Considerable plant food and mud is also found in the stomachs of certain species.

The adult size of the suckers ranges from about six inches in some species to over three feet in others, but the majority are fishes of moderate size.

Breeding.—All the suckers are spring spawners and in prodigious numbers ascend rivers and creeks for this purpose shortly after the disappearance of the ice. In lakes without tributary streams the eggs are spawned in shallow water. They are deposited in a haphazard manner and left without care during the short incubation period. In May and June large schools of freshly hatched sucker fry are a common sight near the margins of most bodies of water.

The males of many species develop red or black pigment on the body and fins during the breeding season, and in most there are

peculiar whitish nodules or "pearl organs" produced at this time, particularly on the head and fins.

Value.—The suckers are of almost no interest to the local angler, as very few species will bite at any sort of lure. They do, however, form an important item in the food of most game fish.

The flesh of the suckers is of moderately good flavour, but is annoyingly full of small "faggot" bones. Under the trade name of "mullets," many thousands of pounds of suckers from Manitoba waters are sold commercially. Recent experiments have shown that there is a possibility of utilizing even greater quantities of suckers by canning the flesh. The process softens the bones and the final product compares favourably with the cheaper grades of salmon.

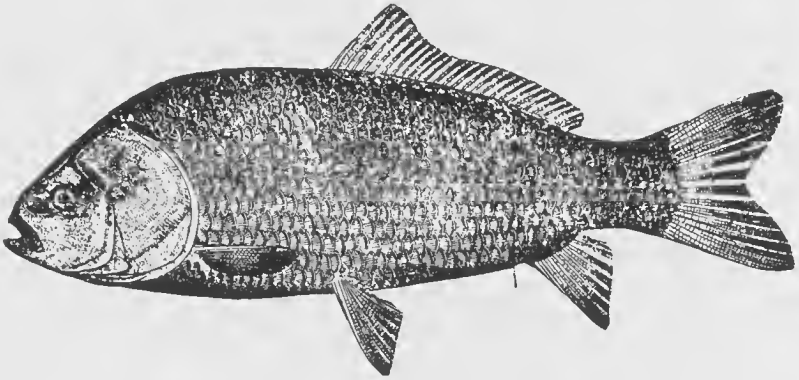
The suckers have been widely condemned by both amateur and professional fishermen because of the belief that they consume vast quantities of the eggs of more valuable fishes, such as pike-perch and whitefish. This belief appears to be based on purely circumstantial evidence, for we have examined several hundred stomachs of suckers taken from the spawning grounds of pike-perch and whitefish and have failed to find viable eggs of any sort.

There are in Manitoba seven genera of suckers, which can be distinguished with the aid of the following key:

KEY TO GENERA OF MANITOBA CATOSTOMIDAE

A. Dorsal fin elongate with 25 to 40 rays.
  B. Mouth large and oblique with thin lips, only faintly striate; upper jaw about as long as snout; anterior rays of dorsal fin only slightly longer than the rest, not much more than half length of base of fin.
  .....The Large-mouth Buffalofish. *Megastomatobus.*
  BB. Mouth small, lower and less oblique; lips fuller and more or less coarsely striate; anterior rays of dorsal fin somewhat lengthened, scarcely half length of base of fin.....The Smallmouth Buffalofish. *Ictiobus.*
  BBB. Mouth small and inferior, lips fairly thick, anterior rays of dorsal fin much longer than the rest, forming a sharp point; their length sometimes equalling length of base of fin.....The Carp Suckers. *Carpiodes.*
AA. Dorsal fin short with 9 to 18 rays.
  1. Lateral line complete and continuous (except in young).
    (*a*) Air-bladder in two parts.
      (*b*) Head convex above; scales in more than 50 rows.
      .....The Fine-scale Suckers. *Catostomus.*
      (*bb*) Head concave above; scales in fewer than 50 rows.
      .....The Hog Sucker. *Hypentelium.*
    (*aa*) Air-bladder in 3 parts.....The Redhorses. *Moxostoma.*
  2. Lateral line completely absent.....The Chub Suckers. *Erimyzon.*

Large-mouth Buffalofish. *Megastomatobus cyprinella* (Valenciennes)



(From Jordan and Evermann)

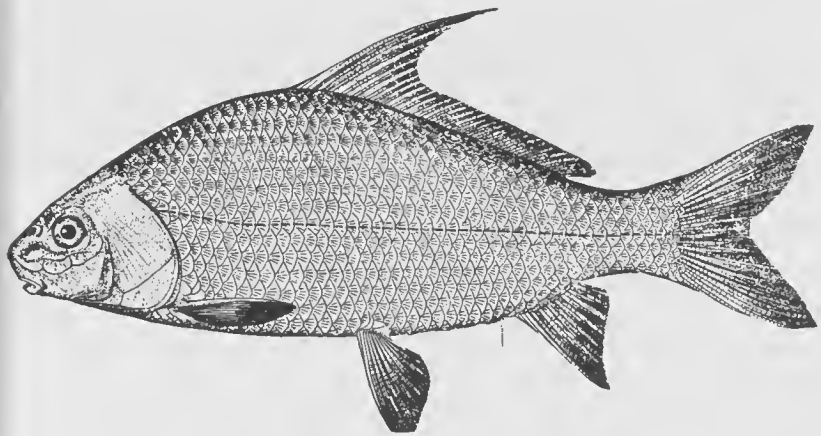
This largest of the suckers reaches a length of three feet and a weight of fifty pounds. In the Mississippi system it is of some commercial importance, but is far too rare to occupy a similar position here. To our knowledge only one specimen, a fish of twenty-eight pounds in weight, has been reported from southern Manitoba.

Small-mouth Buffalofish. *Ictiobus bubalus* Rafinesque

(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

Found in the Great Plains portion of the Hudson Bay drainage of Canada according to Hubbs and Lagler (1941).

Quillback Sucker. *Carpiodes cyprinus* (Le Sueur)



(From Jordan and Evermann)

The quillback has been found in the Red and Assiniboine rivers and the southern part of Lake Winnipeg, where considerable quantities are shipped under the name of "carp." The fish can, however, be distinguished from the true carp by its silvery coloration and lack of barbels about the mouth.

Hubbs (1926) stated that the great individual and age variations exhibited by these fishes had blinded authors to the real diagnostic features and that, as a result of a study of a large amount of material identified as *cyprinus*, *velifer* and *thompsoni*, he found no characters by which these nominal species might be separated. Therefore all are united under the oldest available name, *C. cyprinus* (Le Sueur).

THE FINE-SCALE SUCKERS. Genus *Catostomus*

In Manitoba there are two species of this genus.

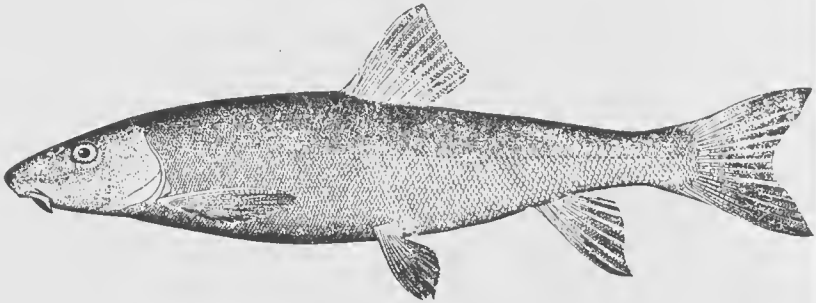
KEY TO SPECIES

A. Scales in lateral line, 95 to 115.....Northern Sucker. ***Catostomus catostomus.***
AA. Scales in lateral line, 68 to 80.....Common Sucker. ***Catostomus commersonii.***

Northern Sucker. *Catostomus catostomus* (Forster)

(Red sucker, sturgeon sucker)
(Catostomus = inferior-mouthed)

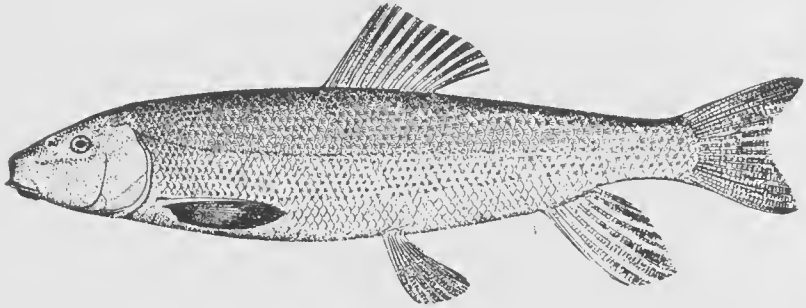
This long-snouted fish is found in Manitoba chiefly in the deeper lakes and rivers and is commonly associated with the whitefish. Its



Northern Sucker. Catostomus catostomus. (From Jordan and Evermann)

flesh is of better flavour than that of many other suckers and may be profitably canned in the future. The males are brilliantly coloured with red in the springtime.

Common Sucker. *Catostomus commersonii* (Lacépède)
(White sucker, brook sucker)

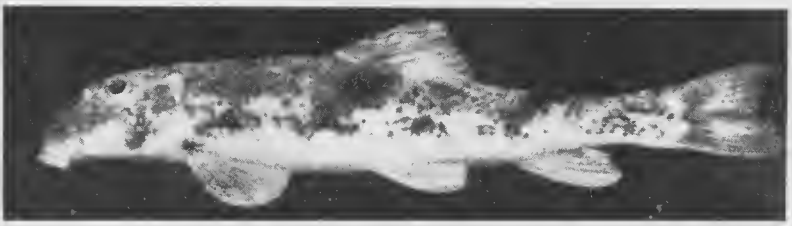


(From Jordan and Evermann)

This sucker is one of the most common fishes in the region and its ability to withstand adverse conditions often enables it to survive in shallow, alkaline lakes where all other fish have been eliminated. Its flesh is of fairly good quality and has been canned successfully. The food items of this species, particularly when young, often include hundreds of species of bottom and planktonic organisms and an examination of the stomach contents of the suckers is a valuable aid in biological surveys.

Hog Sucker. *Hypentelium nigricans* (Le Sueur)
(Stone roller; hammerhead; black sucker)

This peculiar sucker, which is characterized by a very large bony head and dark oblique bars, is of rare occurrence in Manitoba. It



Hog Sucker. Hypentelium nigricans.
(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

has been reported only from the Lake of the Woods area. It has no economic importance.

THE REDHORSES. Genus *Moxostoma*

The members of this genus are characterized by rather brightly coloured fins.

KEY TO SPECIES

A. Halves of lower lip meeting at an angle; length of head 3½ to 4½ in standard length.
  B. Halves of lower lip meeting at an obtuse angle, plicae of lips coarse and regular, dorsal rays 12 to 14.....Greater Redhorse. *Moxostoma rubreques.*
  BB. Halves of lower lip meeting at an acute angle, plicae of lips fine and broken up into papillae, dorsal rays 14 to 17.
.....Silver Redhorse. *Moxostoma anisurum.*
AA. Posterior margin of lower lip a straight line, i.e., halves of lip do not meet at an angle. Length of head 4½ to 5½ in standard length.
.....Northern Redhorse. *Moxostoma aureolum.*

Greater Redhorse. *Moxostoma rubreques* Hubbs

(Mullet; large-scale sucker)

(Original photograph)

This is the species recorded by Jordan and Evermann, Forbes and Richardson and others under the name *M. aureolum*, a name

which Hubbs (1930) has decided should be used for the Northern Redhorse (see below). Although often called Common Redhorse in the Great Lakes area, it is to be doubted whether this species occurs in Manitoba.

Silver Redhorse. *Moxostoma anisurum* (Rafinesque)
(White-nose sucker)
(Anisurum = unequal tailed)

(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

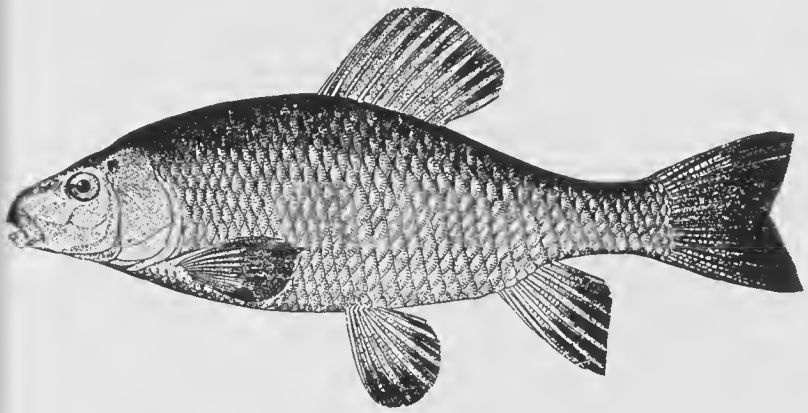
This species ranges from the Hudson Bay drainage of Manitoba to the St. Lawrence River basin in Quebec and southward; in lakes and large rivers.

Northern Redhorse. *Moxostoma aureolum* (Le Sueur)
(Short headed redhorse; picconou)

(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

This is the species formerly designated under the name *lesueuri*. It occurs farther north and west than any other *Moxostoma* and is the common redhorse of northern areas.

Chub Sucker. *Erimyzon sucetta* Lacépède
(Sweet sucker; creek fish)



(From Jordan and Evermann)

This fish is characterized by the complete absence of a lateral line. It has been recorded for Manitoba by Bissett (1927) and Bajkov (1928) and by Hankinson (1929) for North Dakota.

THE MINNOWS. Family CYPRINIDAE

The minnows comprise the largest family of fishes, with over a thousand species widely distributed in the fresh waters of North America, Europe and Asia. Certain European species inhabit salt water. The majority of these fishes are small, but some species attain a weight of fifty pounds or more.

As the staple food of many game and commercial fishes, the minnows are of vast indirect importance, but, with the exception of one or two species, they are of value to the angler in Manitoba only as bait. In the average bait bucket there are often found a number of small fishes which are indiscriminately included under the name "minnow" but are actually the young of other fish. It is important, therefore, that every angler should be able to recognize a true minnow and be sure that he is not depriving himself of future sport by the destruction of young game fish.

To identify a minnow as such is fairly simple by the use of the key to families on page 12. The specific identification, on the other hand, depends upon a number of obscure characters, such as length of intestine, number of pharyngeal teeth, etc., which require dissection to be revealed. This process, due to the small size of most minnows, is a somewhat exacting task and often presents difficulty even to the expert. However, for those readers who have a scientific interest in the matter or are of an enquiring turn of mind, the following key is provided. The "teeth" mentioned in the key are, of course, pharyngeal teeth (Fig. 4, page 2).

It must be admitted that this group has not yet been thoroughly studied in our waters, and it is likely that additions or changes may be made following further investigation.

KEY TO THE GENERA OF MANITOBA CYPRINIDAE

A. Dorsal fin elongate, with a strong, serrated spine; upper jaw with two short barbels on each side.....The Carp. *Cyprinus*

AA. Dorsal fin short and without spines.

B. Intestine spirally coiled around air-bladder.....The Stone Roller. *Campostoma*

BB. Intestine not spirally coiled around the air-bladder.

C. Dorsal fin with first ray enlarged and slightly club-shaped, covered by thick skin and separated from the second ray by a distinct membrane.

D. Mouth terminal and oblique; caudal spot faint; lateral line very short.
.....The Fathead Minnow. *Pimephales.*

DD. Mouth inferior and horizontal; caudal spot conspicuous; lateral line complete.....The Bluntnose Minnow. *Hyborhynchus.*

CC. Dorsal fin with first ray slender and closely attached to the second.

E. Intestine elongate with more than one main loop; peritoneum black.

F. Snout fleshy, overhanging the premaxillaries; scales fewer than 50 in the lateral line; lateral line complete.
.....The Silvery Minnow. *Hybognathus.*

FF. Snout not fleshy; scales more than 65 in the lateral line; lateral line incomplete.....The Red-belly Dace. *Chrosomus.*

EE. Intestine short with one loop only; peritoneum not black.

G. Abdomen behind ventral fins with a fleshy keel over which the scales do not pass; body much compressed; anal rays 12-14; teeth 5–5.....The Golden Shiner. *Notemigonus.*

GG. Abdomen behind ventral fins rounded and fully scaled.

H. Maxillary without trace of barbel.

J. Teeth in main row typically 5–4; lateral line incomplete; scales minute, more than 80 rows along side.
.....The Fine-scale Dace. *Pfrille.*

JJ. Teeth in main row almost invariably 4–4.
.....The Shiners. *Notropis.*

HH. Maxillary with a barbel (often absent in *Margariscus;* sometimes obsolescent in other genera)

K. Barbel terminal; teeth in the main row 4–4.
L. Premaxillaries non-protractile; dorsal fin inserted well behind middle of back.....The Dace. *Rhinichthys.*
LL. Premaxillaries protractile; dorsal fin inserted about at middle of back.
M. Scales fewer than 45 in lateral line.
N. Mouth somewhat oblique; upper lip scarcely overhung by snout; eye shorter than upper jaw.
.....The Hornyhead Chub. *Nocomis.*
NN. Mouth horizontal; upper lip considerably overhung by snout; eye longer than upper jaw.
.....The Silver Chub. *Hybopsis.*
MM. Scales more than 55 in lateral line.
O. Head convex above.....The Lake Chub. *Couesius.*
OO. Head flat above; length up to 12 inches.
.....The Flathead Chub. *Platygobio.*
KK. Barbel on lower edge of maxillary, well in advance of its tip; teeth in the main row usually 5–4.
P. Barbel usually well developed; upper jaw extending to or beyond front of eye; a black spot at front near base of dorsal fin.
.....The Creek Chub. *Semotilus.*
PP. Barbel usually obsolescent; upper jaw not extending to front of eye; sides mottled by specialized dark scales.
.....The Pearl Dace. *Margariscus*

Carp. *Cyprinus carpio* Linnaeus
(European carp; German carp)

Distribution.—Although it is commonly believed that the carp originated in the Orient and was artificially introduced into Europe about 1227, it has been found that the fish did occur naturally in both Europe and Asia. As it is a popular food fish and admirably suited to pond culture, its range has been extended widely by artificial means. It was introduced into England during the reign of Henry VIII, and into North America in 1877 from Germany. It was unknown in Manitoba until 1938, when several specimens were taken from the Red River near Lockport. Since then its range has been extended. Carp are now taken in commercial fishing operations in the southern part of Lake Winnipeg and during the summer of 1943 one specimen was recorded from the Winnipeg River near Point du Bois.

The carp has three distinct varieties: the original wild form which is completely covered by large scales, and two forms which have

Carp. Cyprinus carpio. (*Original photograph*)

arisen through domestication—the mirror carp with several rows of enlarged silvery scales between which are areas of bare skin, and the leather carp, which is quite scaleless. Both scaled and mirror carp were taken from the Red River.

Food and Growth.—The carp is a bottom feeder, omnivorous in its diet, but the principal food items are insect larvae, crustacea and molluscs, which it obtains by rooting amongst the bases of aquatic plants.

The growth, under favourable conditions, is more rapid than that of the majority of our native fishes and specimens of fifty pounds weight have been reported from the United States. As a general rule the mirror carp attains a larger size than the scaled form.

Breeding.—The carp spawns in the spring and deposits the eggs in small batches over a wide area of bottom in shallow, weedy waters. The eggs, which are strongly adhesive, become attached wherever they fall, and undergo their short incubation period of about two weeks without the benefit of parental care.

Value.—In Europe the carp has been domesticated for centuries and is raised in great numbers, both for domestic use and the markets. It was with this in mind that the fish was first introduced into the United States, but, because of improper handling, it soon gained a very bad reputation as a food fish. Many would-be carp farmers disdainfully dumped their stock into public waters, where the fish increased at a tremendous rate and spread rapidly through many river systems. At the present time it is the most important commercial fish in many states.

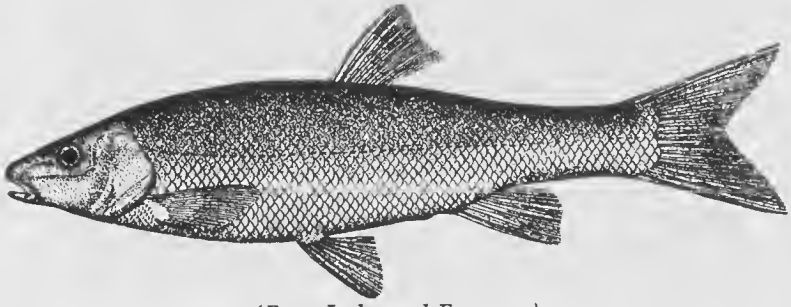
The carp has also been strongly censured by conservationists because of its habit of rooting amongst aquatic plants, thus keeping

the waters constantly muddy and destroying large areas of the plants used as food by aquatic game birds. Such turbid water is also detrimental to more valuable game fish. In this province the carp is too recent an invader for there to have been any direct evidence of its activity along these lines.

This fish may have great potential value for Manitoba as a commercial fish and also as an inhabitant of some of the hundreds of dugouts which have been made on prairie farms in recent years.

The carp will not take a spinner or artificial fly but its bottom-feeding habits and large size make it a fit subject for the still-fisherman.

Stone Roller. *Campostoma anomalum* (Rafinesque)



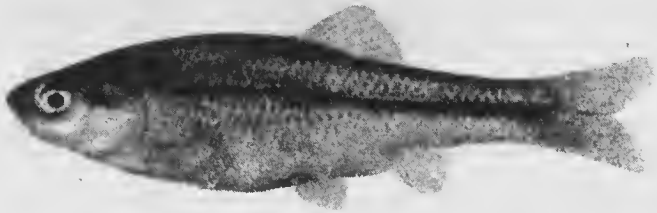
(From Jordan and Evermann)

A hardy minnow, excellent as bait or as an aquarium fish; food, chiefly vegetable.

Included as a possible Manitoba species on the basis of North Dakota records (Hankinson, 1929).

Fathead Minnow. *Pimephales promelas* Rafinesque

(Blackhead minnow)
(Promelas = black before)

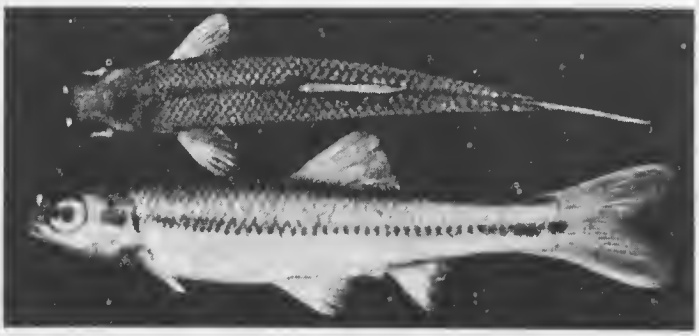


(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

A small minnow, rarely exceeding two inches in length; a common minnow in muddy waters such as sluggish creeks and alkaline lakes of the prairie region. Its food consists of mud with its content of algae, minute crustaceans and insect larvae. Of little value as bait, but extremely useful as a forage fish.

In the breeding season the heads of the males are black and heavily tuberculated.

Bluntnose Minnow. *Hyborhynchus notatus* (Rafinesque)
(Notatus = spotted)



(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

Another mud eating minnow, reaching a slightly larger size than the preceding species; not so strictly confined to muddy situations. Valuable as a forage fish.

Silvery Minnow. *Hybognathus nuchalis* Agassiz

Recorded for Manitoba by Thompson (1898), by Bissett (1927), and Bajkov (1928); also by Hubbs and Lagler (1941) as "perhaps the Red River of the North in Manitoba."

A silvery minnow sometimes reaching a length of six inches. The scales are loosely attached and the fish is not hardy; therefore of little value as bait. Food, chiefly algal matter with some mud.

Red-belly Dace. *Chrosomus eos* Cope

A small minnow, characteristic of boggy lakes. At spawning time the abdomen of the male is a flaming scarlet. Preceding and following the assumption of the red, the abdomen is a canary yellow.

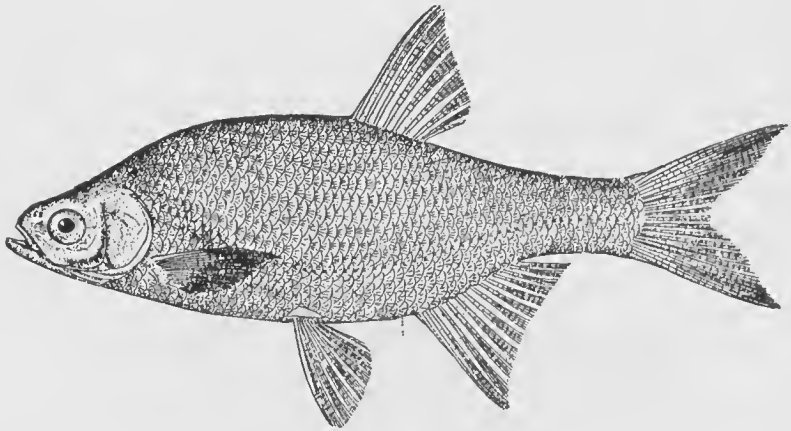
Red-belly Dace. Chrosomus eos
(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

The specific name *erythrogaster*, under which this minnow was formerly known, is now confined to a more southern species.

Fine-scale Dace. *Pfrille neogaea* (Cope)

A small species sometimes found associated with *Chrosomus* in bog situations, but possibly not in Manitoba. Like that species, the abdomen of the male is also red in the spawning season and yellow before and after the full coloration is assumed. At other seasons the abdomen is pearly white.

Golden Shiner. *Notemigonus crysoleucas* (Mitchill)
(Roach; bream)
(Crysoleucas = gold-white)



(From Jordan and Evermann)

A deep-bodied minnow, tinged with golden yellow. Southward it reaches a length of ten inches, but does not usually reach so large

a size with us. Its brilliant metallic sheen makes it an excellent bait for game fish.

Frequently found at the mouths of rivers and on sandy beaches around the southern half of Lake Winnipeg.

THE SHINERS. Genus *Notropis*

The members of this genus are widely distributed throughout both the United States and Canada. In Manitoba they are the most common minnows and are found in almost every body of water.

At the present time the genus is being revised and many species have been placed in other genera. However, pending further study, the old classification is retained in the following key:

KEY TO THE SPECIES

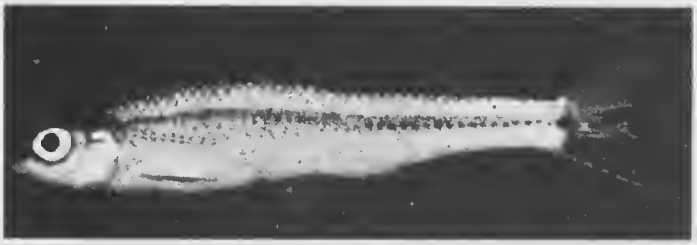
A. Anal rays 9 to 12 (rarely 8), teeth 2.4–4.2.
  B. Origin of dorsal as far or slightly farther forward than insertion of pelvics.
    .....Common Shiner. *N. cornutus.*
  BB. Origin of dorsal distinctly behind insertion of pelvics.
    C. Body deep, the depth typically more than head (in adults) or equal to head length (in young), exposed portions of scales notably deeper than long.
      .....Red-fin Minnow. *N. umbratilis.*
    CC. Body slender, depth much less than length of head; exposed portions of scales not notably deeper than long.
      D. Snout short and blunt, its length less than two-thirds the distance from the posterior margin of eye to posterior end of head.
        .....Lake Shiner. *N. atherinoides.*
      DD. Snout produced and sharp, its length more than two-thirds the distance from the posterior margin of the eye to the posterior end of the head.
        .....Rosy-face Minnow. *N. rubellus.*
AA. Anal rays usually 7 or 8, rarely 9; teeth in outer row usually 0 or 1 (often 2 in *hudsonius*).
    E. A large conspicuous and well-defined black spot at base of caudal fin.
      .....Spot-tail Minnow. *N. hudsonius.*
    EE. No large conspicuous and well-defined black spot at base of caudal fin.
      F. Lateral band blackish (sometimes very indistinct in life), continued forward through eye and around muzzle; lateral line incomplete.
        .....Black-nose Shiner. *N. heterolepis.*
      FF. Lateral band dusky or obsolete, not definitely continued forward through eye and around muzzle, lateral line complete.
        G. Anal rays almost always 7.
          H. Teeth usually 1 or 2, 4–4, 1 or 2; mid-dorsal stripe not expanded at front of dorsal but surrounding base of that fin.
            .....River Shiner. *N. blennius.*
          HH. Teeth 4–4; mid-dorsal stripe expanded in front of dorsal fin and interrupted at front of dorsal base. Sand Shiner. *N. deliciosus.*

GG. Anal rays almost always 8.

J. Mouth small; length of upper jaw about equal to diameter of eye; exposed surface of anterior lateral line scales elevated, more than twice as high as long, teeth 4–4.
.....Mimic Shiner. *N. volucellus.*

JJ. Mouth large, upper jaw longer than eye; exposed surface of lateral line scales not elevated but of usual shape; teeth 1.4–4.1.....Big-mouth Shiner. *N. dorsalis.*

Spot-tail Minnow. *Notropis hudsonius* (Clinton)
(Spawn-eater; shiner)



(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

The spot-tail minnow is common in almost all our larger lakes and rivers. It reaches a length of six inches. Its food consists of algae, insect larvae and crustacea. It is the choice bait-minnow of many anglers and is sold in quantity at Lockport. The silver coloration and conspicuous black tail-spot make it easy to identify this fish. Its reputation as an eater of the spawn of other fishes requires verification.

The minnow recorded by Eigenmann and Eigenmann (1893) from the Red River at Winnipeg and the Assiniboine at Brandon under the name *scopiferus* belongs to this species.

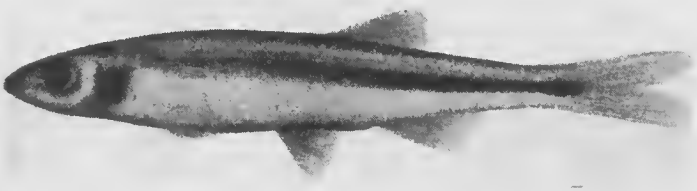
Lake Shiner. *Notropis atherinoides* Rafinesque

(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

The lake shiner is common in lakes and larger streams. It reaches a length of four inches.

This species is commonly found together with the spot-tail and is sold for bait at Lockport. It is important as food for game fishes.

Rosy-face Minnow. *Notropis rubellus* (Agassiz)



(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

This species possibly occurs in southern Manitoba. It has been recorded from Lake of the Woods (Evermann and Goldsborough 1907) and North Dakota. It was formerly known under the name *rubrifrons*.

Common Shiner. *Notropis cornutus* (Mitchill)

(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

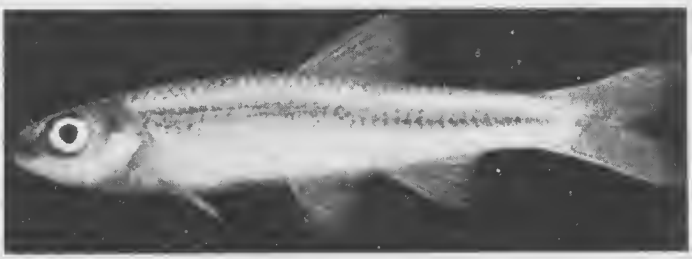
The common shiner is a stream species. It reaches a length of six inches. During the breeding season in spring the male is brilliantly coloured. It is an attractive aquarium fish and excellent bait for game fish.

Black-nose Shiner. *Notropis heterolepis* Eigenmann and Eigenmann

(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

This small minnow perfers muddy or boggy situations in lakes. Minnows formerly recorded under the name *cayuga* belong to this species.

Mimic Shiner. *Notropis volucellus* (Cope)

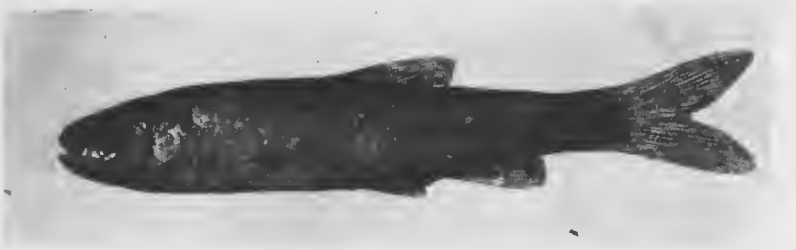


(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

This small silvery minnow and its close relative *Notropis deliciosus* have often been confused under the name *Notropis blennius* (Hubbs and Greene 1928). The above key gives the characters by which the three may be distinguished. *N. volucellus* undoubtedly occurs in Manitoba but it is to be doubted whether *deliciosus* does.

River Shiner. *Notropis blennius* (Girard)

As explained under the preceding species, this name has often been applied to minnows to which it does not properly belong. The true *blennius* however occurs in Manitoba. This is the minnow re-



River Shiner. Notropis blennius. (Original photograph)

corded by Eigenmann (1894) from the Red River at Winnipeg and the Assiniboine at Brandon under the name *jejunus* (Hubbs 1926).

Red-fin Minnow. *Notropis umbratilis* (Copeland)

(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

This species is included as a possible Manitoba species on the basis of records from the Lake of the Woods region.

Big-mouth Shiner. *Notropis dorsalis* (Agassiz)

Included as a possible Manitoba species on the basis of specimens taken by Hankinson (1929) in the Pembina River in North Dakota.

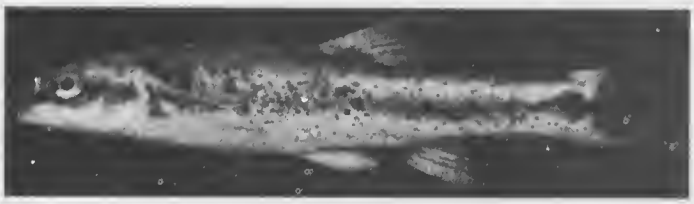
THE DACE. Genus *Rhinichthys*

This small group contains but two species, which can be distinguished as follows:

A. Snout projecting far beyond the mouth, which is horizontal; eyes placed high up on the head.....The Long-nosed Dace. ***Rhinichthys cataractae.***

AA. Snout scarcely projecting beyond the somewhat oblique mouth; eyes lateral. .....The Black-nosed Dace. ***Rhinichthys atratulus.***

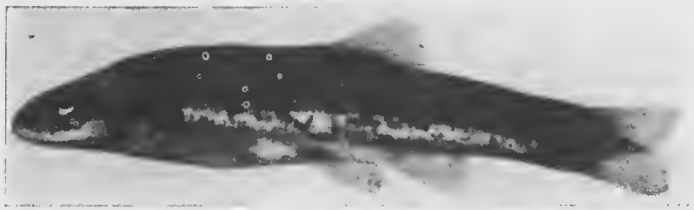
Long-nose Dace. *Rhinichthys cataractae* (Cuvier & Valenciennes)
(Cataractae = of waterfalls)



(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

This minnow is found fairly commonly in cool, rapid streams from the Atlantic coast to the central region of the continent. It reaches a length of four inches and is excellent as live bait.

Black-nose Dace. *Rhinichthys atratulus* (Hermann)



(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

The black-nose dace is found in warmer water than the long-nosed species and does not extend so far northwestward. It has been recorded from the Lake of the Woods region and from North Dakota. At spawning time it assumes a red coloration on the sides.

Lake Chub. *Couesius plumbeus* (Agassiz)
(Plumbeus = lead-coloured)

A common minnow in many northern lakes, usually seen most frequently in late spring or early summer, when it leaves the lakes

Lake Chub. Couesius plumbeus. (Original photograph)

and enters tributary creeks to spawn. It is important as food for carnivorous fishes, particularly lake trout.

Silver Chub. *Hybopsis storerianus* (Kirtland)

One of the larger minnows, sometimes reaching a length of five or six inches; found in larger streams and lowland lakes southward.

Recorded by Eigenmann (1894) from the Red River at Winnipeg and by Hankinson (1929) from the Red and Pembina rivers in North Dakota.

Hornyhead Chub. *Nocomis biguttatus* (Kirtland)

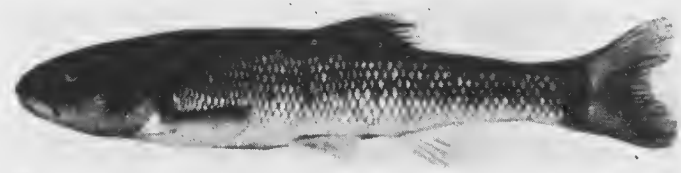
(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

A large Chub-like minnow found in the Red River in North Dakota, and hence may occur in Manitoba.

Pearl Dace. *Margariscus margarita nachtriebi* (Cox)

Widely distributed in Canada from the Rocky Mountain region to the Maritime Provinces. Usually found in cool lakes, bays or streams.

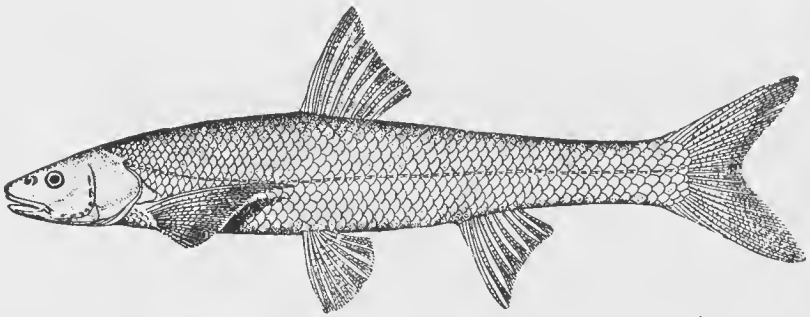
Creek Chub. *Semotilus atromaculatus* (Mitchill)
(Horned dace)
(Atromaculatus = black spotted)



(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

One of the larger of eastern minnows, reaching a length of ten inches. Recorded from the Red and Pembina rivers in North Dakota, and hence to be looked for in southern Manitoba.

Flathead Chub. *Platygobio gracilis* (Richardson)
(Gracilis = graceful)



(From Jordan and Evermann)

This chub, which reaches a length of twelve inches, is found chiefly in the western portion of the continent. Occasional specimens are taken by commercial fishermen in Lake Winnipeg, and the fish is very common around rapids in the Assiniboine River. Here it can be caught by a small baited hook or artificial fly.

THE CATFISHES. Family AMEIURIDAE

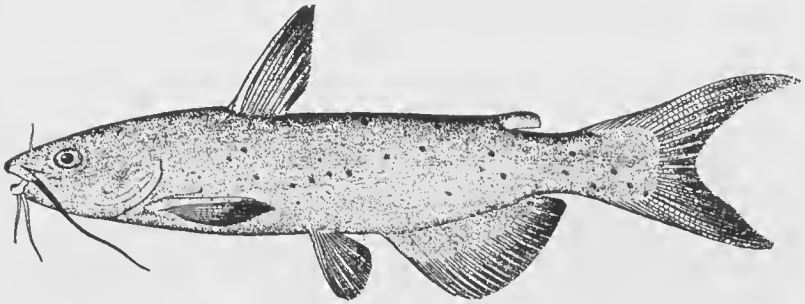
The catfishes are a large and varied group belonging to twenty-three families, comprising some two thousand species. North American catfishes belong to the family Ameiuridae, which is peculiar to this continent except for one species in China.

In Manitoba there are four genera, which can be separated as follows:

KEY TO GENERA OF MANITOBA AMEIURIDAE

A. Adipose fin not connected with caudal fin.
  B. Tail deeply forked; large fish.....The Channel Cats. *Ictalurus.*
  BB. Tail rounded; fish small or medium in size.....The Bullheads. *Ameiurus.*
AA. Adipose fin continuous with caudal; separated only by a slight notch. Small fish.
  C. Skin thick; band of premaxillary teeth with backward extensions.
  .....The Stone Cats. *Noturus.*
  CC. Skin thin, premaxillary teeth without backward extensions.
  .....The Mad Toms. *Schilbeodes.*

Channel Cat. *Ictalurus lacustris* (Walbaum)



(From Jordan and Evermann)

Distribution.—The channel cat is found in the larger streams from the Gulf of Mexico throughout the Mississippi Valley to the Great Lakes region. In Manitoba it is not particularly abundant and is found chiefly in the larger rivers to the east and south of Lake Winnipeg. The northern limit of its distribution is uncertain.

Food.—The channel cat feeds principally on bottom organisms such as insect larvae, crustacea and molluscs which it locates by means of its sensitive "feelers" or barbels. It is interesting to note that when feeding on shell-fish the cat cracks the shell and swallows only the soft parts of the animal. Small fishes and some vegetable matter are also found in the stomachs occasionally.

Growth.—This fish reaches an extreme length of about three feet and a weight of thirty pounds, but the average is much less than this. Fifteen and twenty-pound specimens were not uncommon in the Red River a few years ago.

Breeding.—Like the majority of its family, the channel cat is a spring spawner and deposits its eggs in a rough sort of nest, which is guarded by the male parent.

Value.—The catfish is not abundant enough to be of great commercial importance, but there are small local fisheries at the mouths of the larger rivers, such as the Red. Approximately 15,000 pounds are produced annually. The fish are taken by commercial fishermen, chiefly on long dead-lines staked out in the river channels.

It will, on rare occasions, bite at a spinner, but is usually taken by anglers on a baited hook. It is a powerful fish and can put up a vigorous fight.

The flesh is white, firm and of good flavour.

Formerly two large catfishes were recognized under the names channel cat (*Ictalurus punctatus*) and Great Lake catfish (*Villarius lacustris*). It has now been decided that these constitute a single species, of which the scientific name is *Ictalurus lacustris*.

THE BULLHEADS. Genus *Ameiurus*

Two species of this genus are found in Manitoba and, although very similar in appearance, can be distinguished as follows:

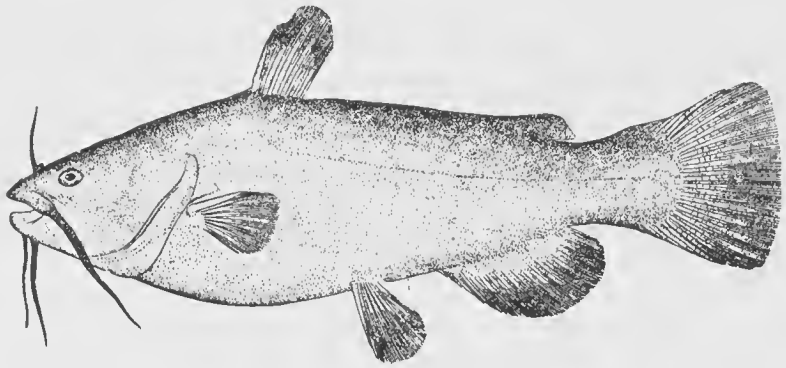
A. Anal rays 21 to 24. Colour dark yellowish brown with large blackish blotches. .....The Common Bullhead. *Ameiurus nebulosus.*

AA. Anal rays 17 to 20. Colour uniformly dark brown or black. .....The Black Bullhead. *Ameiurus melas.*

These two bullheads are very similar in habits, and the following paragraphs refer to both.

Bullheads. *Ameiurus nebulosus* (Le Sueur) and *Ameiurus melas* (Rafinesque)

Distribution.—The bullhead is common in sluggish waters throughout the eastern portion of the continent. It has been artificially introduced into the waters of the Pacific coast and Europe. In Manitoba it is abundant in the majority of the sluggish streams and lakes in the southern portion of the province.



Bullheads. Ameiurus nebulosus. (From Jordan and Evermann)

Food.—Like the other catfishes, the bullhead feeds primarily upon bottom animals, but will also take small fish and even carrion. The eyes are very small and almost useless in the murky waters which this fish inhabits, so food is located by the keen sense of smell and the long barbels, which are beset with taste-buds.

Growth.—The maximum length attained by the common bullhead is about eighteen inches, but the black bullhead is smaller, being less than ten inches.

Breeding.—The bullhead breeds in the early summer and constructs a nest which may be a roughly circular hole scooped out of a gravel or mud bottom or a natural depression beneath a log or stone. Both parents participate in preparing the nest, but after the eggs are deposited it is usually the male only who assumes the care of the eggs and young. The egg masses are kept constantly stirred and aerated by movements of the fins and barbels, and the fish often take in large mouthfuls of eggs and "blow" them back into the nest.

The fry hatch in about two weeks and swim about in the immediate vicinity of the nest. Stragglers are sucked up by the guardian parent and blown back into the nest. Later, as the fry begin to swim more freely this sucking habit is continued by the parent, but the young fish are not always ejected.

Eventually the parents leave the young fish, which then desert the nest altogether and swim about near the surface in large schools containing several hundred individuals. These swarms, which appear as slowly moving black patches in the water, are a familiar sight during July and August, particularly around the southern shores of Lake Winnipeg.

Value.—Although of considerable economic importance in the United States, less than 30,000 pounds are taken annually by commercial fishermen in Manitoba. This seems to be due to a strong local prejudice against this fish, based largely on its unattractive appearance. Actually the flesh is of good flavour and compares favourably with most other freshwater fishes.

Its small size and peculiar "spiral" fighting tactics render the bullhead a very unsatisfactory game fish. It also has the unpleasant habit of gorging a baited hook to the point where a surgical operation is necessary for its removal, during which the operator is almost invariably punctured by the sharp and poisonous spines contained in the dorsal and pectoral fins. However, its abundance and willingness to bite make the bullhead a prime favourite amongst juvenile anglers and those who demand quantity rather than quality.

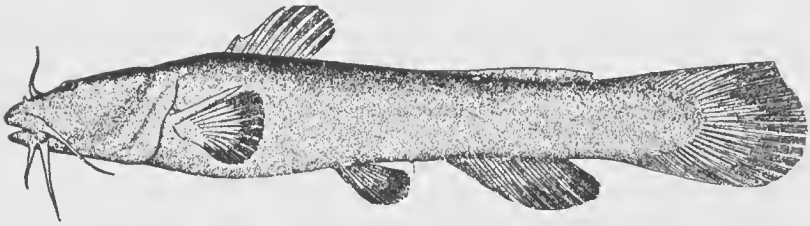
The bullhead is undoubtedly the most hardy of our fishes and can exist in waters from which other fish have been eliminated by adverse conditions. This hardiness also makes it a good species for the aquarium, where its feeding habits provide an interesting study.

Mad Tom. *Schilbeodes gyrinus* (Mitchill)

(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

This is the smallest of the local catfishes and rarely exceeds three or four inches in length. It is not common anywhere in the province, but is encountered occasionally in the Red and Assiniboine rivers. The poison glands connected with the spines are particularly well developed and a wound made by this catfish is as painful as a bee's sting.

Stone Cat. *Noturus flavus* Rafinesque



(From Jordan and Evermann)

Although recorded for Manitoba by Bissett (1927), the record needs confirmation.

THE PIKES. Family ESOCIDAE

This family includes one genus and five species, one of which is cosmopolitan in its distribution and the others confined to the fresh waters of North America. In Manitoba we have authentic records of but one species, the common pike, but the maskinonge occurs on the eastern borders of the province.

KEY TO MANITOBA ESOCIDAE

A. Cheeks entirely scaled; operculum scaled only on upper half; body spots light on dark ground; branchiostegal rays 14 to 16.....Common Pike. *Esox lucius.*

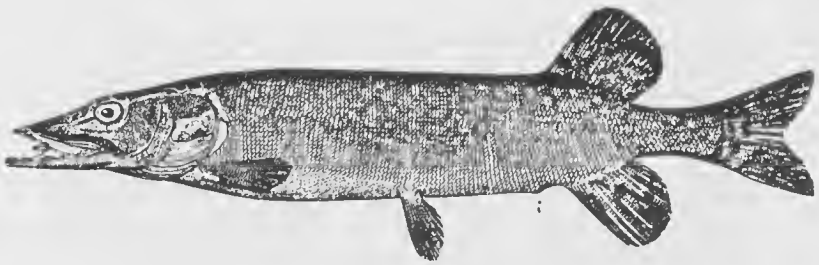
AA. Cheeks and operculum scaled only on upper half; body spots, if present, dark on a light ground (body may be barred or immaculate); branchiostegals 17 to 19. .....Muskellunge. *Esox masquinongy.*

Common Pike. *Esox lucius* Linnaeus

(Jackfish; great northern pike; pickerel)

Distribution.—As shown on the map on page 92, this fish is distributed over most of the Northern Hemisphere. In Manitoba it is our most common game fish, and is to be found in almost every stream and lake from the United States boundary to the Arctic.

Food and Growth.—The pike has been rather aptly described as "a mere machine for the assimilation of other organisms," and it is true that only the largest of the creatures to be found in or on the water are safe from the pike's well-toothed jaws. Other fishes are the most important item in its diet, but frogs, mice, muskrats, aquatic birds, crustacea, and insect larvae are occasionally found in the stomachs of pike. The capacity of a pike is truly amazing, as



Common Pike. Esox lucius. (From Jordan and Evermann)

it will often swallow another fish almost as large as itself. One small pike, one and one-quarter inches long, kept in an aquarium was observed to attack another pike one inch in length. The smaller fish was swallowed head first and remained half out of its captor's mouth for twelve hours. Within twenty-four hours it had been completely swallowed and the next day the larger fish again commenced feeding.

In accordance with its voracious appetite, the growth of the pike is quite rapid, being at least a pound a year. The maximum weight attained in this country is approximately fifty pounds. In Manitoba fifteen and twenty-pound specimens are not rare.

Breeding.—Pike first spawn when two years of age. The fish ascend small streams early in the spring and deposit their eggs, usually amongst the debris of aquatic plants in marshy or freshly flooded areas. The eggs are numerous, there being as many as 200,000 in a large female. No care is taken of the eggs after they are deposited, and the fry hatch in about two weeks.

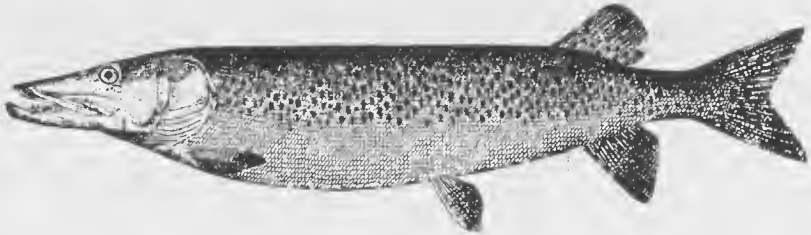
Value.—The pike is not highly regarded as a food fish here, although from two to three million pounds are taken annually by commercial fishermen in Manitoba. The flesh of pike taken from cold water is white, firm and flaky, but, if taken in warm weather from shallow water, is inclined to be soft and of a muddy taste.

Its reputation as a game fish varies with the locality, it being eagerly sought in some waters and regarded as a nuisance in others. It is undoubtedly the most "reliable" of our fishes in its willingness to bite at almost any sort of artificial or natural bait. Large, flashy lures are most effective, but the pike will strike savagely at any moving object.

It has been widely condemned by conservationists recently, and accused of eating considerable numbers of young ducks and muskrats.

Muskallunge. *Esox masquinongy* (Mitchill)

(Muskellunge; maskinonge and other variations; lunge; muskie)



(From Jordan and Evermann)

Distribution.—This species is found principally in the upper Mississippi Valley and the Great Lakes system, but occurs also in the upper reaches of the Winnipeg River and in the Lake of the Woods region, and may therefore be found in Eastern Manitoba. All alleged specimens from this region examined by us to date have been merely large pike.

Food and Growth.—The muskallunge, like the pike, is essentially a fish eater. It attains a larger size and specimens of over seventy-five pounds have been recorded. The largest fish taken on rod and line weighed over fifty-eight pounds.

Value.—The muskallunge is too highly regarded as a game fish to have other than accidental commercial importance. It is eagerly sought by anglers, who value it for its great size and comparative scarcity. Fishing is usually by trolling with large artificial spoons or plugs.

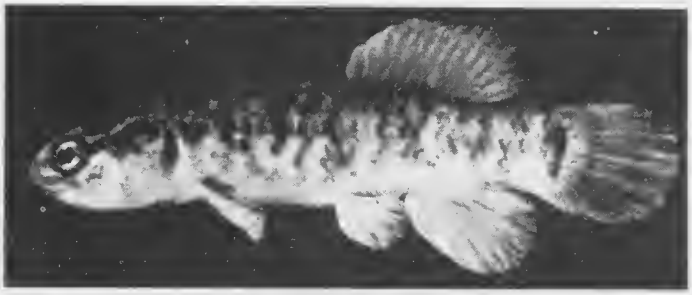
THE MUDFISHES. Family UMBRIDAE

This small family contains but one genus with three species—two American and one European. One species is found in Manitoba.

Mudminnow. *Umbra limi* (Kirtland)

(Limi = mud)

This small fish, which rarely exceeds five inches in length, has been found but recently in eastern Manitoba and recorded from muskeg lakes near the Mukutawa River in Township 49, Range 4, E.P.M. It has no economic importance, but is interesting because of its great resistance to adverse conditions. It can live in mere



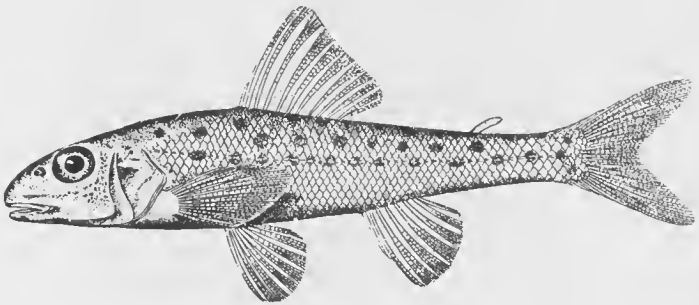
Mudminnow. Umbra limi.
(From "Guide to the Fishes of the Great Lakes and Tributary Waters," Hubbs and Lagler)

bog holes, and even exists buried in mud for a considerable time if the water evaporates. It feeds on both animal and vegetable food and breeds in early spring.

THE TROUT PERCHES. Family PERCOPSIDAE

This small family, which includes only two genera, each containing a single species, is of considerable scientific interest, due to the remarkable combination of the perch and trout family characteristics. The scales, like those of the perch, are strongly ctenoid, yet an adipose fin, characteristic of the trouts, is also present. One species is found in Manitoba.

Trout Perch. *Percopsis omiscomaycus* (Walbaum)



(From Jordan and Evermann)

Distribution.—The trout perch is widely distributed in North America from Lake Champlain westward to Kansas and north to Hudson Bay. In Manitoba it is abundant in practically all the larger lakes and streams.

Three thousand parent pike-perch ready to participate in the spring spawning at Swan Creek Hatchery on Lake Manitoba.
Photo by M. E. Butler

Spawning.—In the early spring this fish ascends rivers in large schools and deposits its eggs amongst the rocks in rapid water. Great numbers of spawning trout perch are to be found at the foot of the Lockport dam in May.

Value.—Although of no direct economic importance, the indirect value of this little fish as food for the large carnivorous species is considerable.

THE PERCHES. Family PERCIDAE

This family is distributed throughout the fresh waters of Europe, Asia and North America. The family may be divided into two subfamilies, the Percinae or true perches, and the Etheostominae or darters. The majority of the species belong in the latter group.

The subfamilies can be distinguished as follows:

A. Fish reaching a weight of one pound or more; branchiostegal rays 7; no anal papilla; preoperculum serrate.....The True Perches. Subfamily *Percinae.*
AA. Fish small, maximum size 8 or 9 inches; branchiostegal rays 6; anal papilla present; preoperculum not serrate.....The Darters. Subfamily *Etheostominae.*

THE TRUE PERCHES. Subfamily PERCINAE

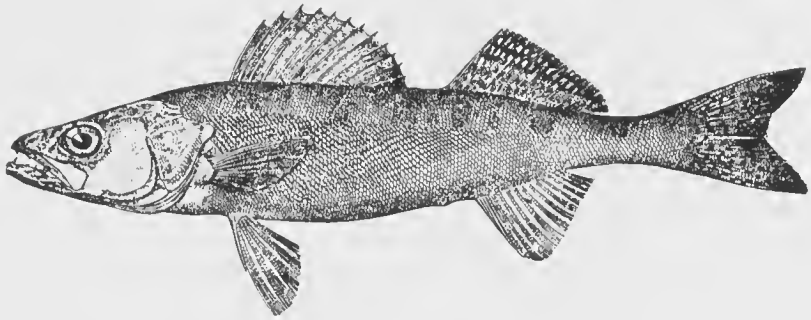
These are fishes of moderate or large size which are of considerable economic importance. In Manitoba there are three species, which may be distinguished as follows:

A. Canine teeth on jaws and palatines; body elongate and more or less cylindrical.
B. Cheeks smooth and scaleless; spinous dorsal smudged with black and with a solid black patch on the last dorsal spines; pyloric caeca 3 and equal in length.....Yellow Pike-Perch. *Stizostedion vitreum.*
BB. Cheeks rough and scaly; spinous dorsal with rows of black spots; pyloric caeca 4 to 8 of unequal length.....Sauger. *Stizostedion canadense.*
AA. No canine teeth; body compressed, marked by vertical bands of dark pigment. .....Yellow Perch. *Perca flavescens.*

Yellow Pike-perch. *Stizostedion vitreum* (Mitchill)

(Pickerel, wall-eyed pike, yellow, doré)
(vitreum = glassy)

Distribution.—This fish is distributed throughout eastern and northern North America. In Manitoba it is particularly abundant in the eastern and northern lakes and streams and its range has been artificially extended to include all but the shallowest of the prairie lakes.



Yellow Pike-perch. Stizostedion vitreum. (From Jordan and Evermann)

Food and Growth.—The pike-perch is largely piscivorous and takes a tremendous toll of minnows and other fish, its own young included. It has been estimated that each pike-perch consumes from two to three thousand small fish annually. Other food items include crayfish, smaller crustacea and insect larvae.

The growth of the pike-perch varies with its habitat, but in larger lakes is at the rate of approximately six ounces per year for the female fish and even less for the male. The average weight of the fish taken in commercial catches in Manitoban waters is less than three pounds, but the largest pike-perch taken in commercial fishing operations during recent years is one caught at McBeth's Point on Lake Winnipeg that scaled thirteen pounds and four ounces. This specimen, mounted, adorns the wall of a Winnipeg office.

Breeding.—The female pike-perch attains sexual maturity at an age of six years and deposits eggs each year thereafter. The male fish matures a year earlier. The eggs, which are very small, number approximately 45,000 per pound of body weight of the fish and are deposited on hard bottom usually in moving water. The spawning act takes place usually in April, and the fry hatch in from one to three weeks, depending on the water temperature. No care is taken of either the eggs or the fry by the parent fish.

This species is handled in three of the fish hatcheries in Manitoba and some one hundred and sixty million fry are liberated annually.

Value.—At the present time the pike-perch or pickerel is the second most valuable commercial fish in Manitoban waters, there being from seven to nine million pounds marketed annually. The market value of this catch has varied from $600,000 to $900,000 in recent years.

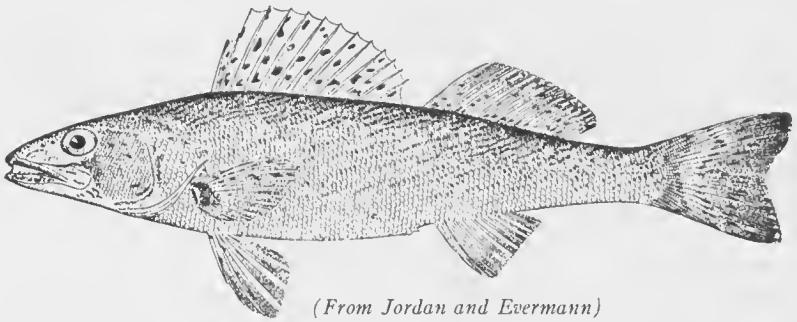
These fish are taken by gill nets, and the principal areas of production are lakes Winnipeg, Winnipegosis, Manitoba and Dauphin.

As a game fish the pike-perch or, as it is more commonly known, the pickerel, is highly esteemed by local anglers. It bites readily at a wide variety of artificial lures or natural baits and, in addition to being a vigorous fighter, is an excellent pan fish.

Note.—The blue pike-perch *Stizostedion vitreum glaucum*, which is distinguished by its larger eye, bluish coloration and smaller size, occurs in the eastern portion of Lake Winnipeg. In lakes of eastern Manitoba, there occurs a pike-perch which varies in a number of ways from the typical *S. vitreum*. This fish is very dark in coloration, has a predominantly yellow rather than a greenish hue and has scaly cheeks like the sauger.

Sauger. *Stizostedion canadense* (Smith)

(Sand pike)



(From Jordan and Evermann)

Distribution.—This slimmer relative of the pike-perch has a similar distribution. It is often confused with the larger species, but is readily recognized, due to the presence of scales on the cheek.

Food and Growth.—The food of the sauger is very similar to that of the pickerel, but it does not attain such a large size. It reaches a length of eighteen inches and a maximum weight of slightly over two pounds.

Breeding.—The sauger matures at an age of five years and a weight of about twelve ounces. The breeding time and habits are similar to those of the pike-perch, but the sauger is more inclined to utilize gravel bars in lakes as spawning grounds.

It has been found possible to cross-fertilize sauger and pike-perch artificially, and fish which appear to be hybrids are frequently encountered in nature, particularly in the south end of Lake Manitoba.

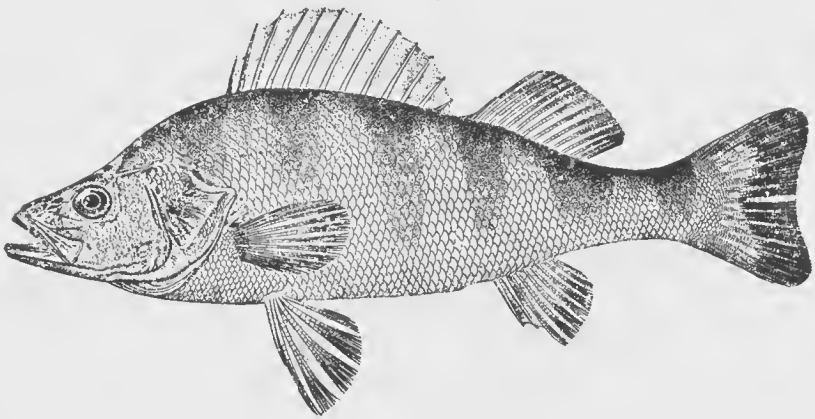
Value.—In certain of our lakes, the depletion of the pike-perch by intensive commercial fishing has allowed the sauger to increase to such an extent that almost one third of the total production of fish in Manitoba is now composed of this species. It has taken first place in value of production in recent years.

Due to its small average size of less than a pound, the sauger does not occupy a prominent position as a game fish. It will, however, take a baited hook readily. It is very abundant at Lockport during the early summer.

Yellow Perch. *Perca flavescens* (Mitchill)

(English perch; raccoon perch)

(Flavescens = yellow)



(From Jordan and Evermann)

Distribution.—The perch is commonly found in northern and eastern North America. In Manitoba it is abundant in all but the smallest streams and is to be found in the majority of lakes. It is particularly abundant in rich, shallow lakes such as Lake Manitoba.

Food and Growth.—The perch is essentially carnivorous and feeds upon other fish, crustacea, insects and their larvae, and molluscs. The growth of the perch is comparatively slow, and the maximum size attained in our waters does not exceed two pounds, with the average being about half a pound. In other parts of the continent specimens exceeding four pounds in weight have been reported.

Breeding.—The perch reaches sexual maturity at an age of two years and a weight of about three ounces. The spawning act takes place in the spring when the water reaches a temperature of about

50° F. The eggs are extended in an elongated, ribbon-like mass, which, after water-hardening, may be from two to seven feet in length. These strings are usually deposited freely in the water, but in some cases become attached to aquatic vegetation or submerged brush. Often after a storm great numbers of these egg-strings can be found washed up on beaches. The fry usually emerge from the egg in from two to three weeks.

Value.—The flesh of the perch compares very favourably in quality with most other freshwater fishes and it commands a good price on the market. About 800,000 pounds, most of which comes from Lake Manitoba, are marketed annually.

Its small size precludes it from being classed as a first-rate game fish, but it is extremely popular with those anglers who demand rapid action and quantity. The perch move in large schools which, when encountered by the angler, will provide fast and furious activity. Perch are usually taken by means of a hook baited with minnow, worm, grasshopper or meat of some kind, but will also strike at small spinners and, on occasion, the artificial fly.

THE DARTERS. Subfamily ETHEOSTOMIDAE

The numerous species in this subfamily are all small, often brightly coloured fishes which are very secretive in their habits and, therefore, very little known to the average fisherman. They have no direct commercial or sporting value, but are often mistaken by the layman for the young of the true perches.

The darters are usually to be found resting on the bottom, and their extremely rapid movements when disturbed have given them their name. Some species inhabit the still water of lakes, while others occur amongst the stones in the swiftest streams. They feed principally upon insect larvae and small crustaceans. All are spring spawners and deposit a comparatively small number of eggs.

This group has not been thoroughly studied as yet, and it is likely that new species may be added to our lists subsequently. The following key covers the genera known to occur in our waters:

KEY TO THE GENERA OF MANITOBA DARTERS

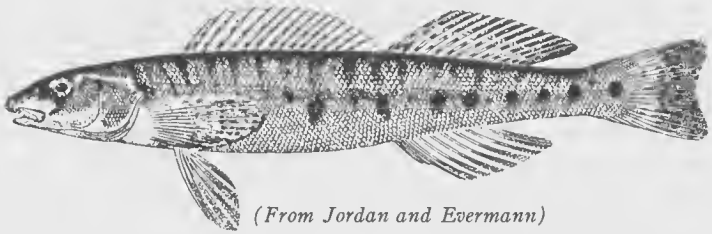
A. Premaxillaries not protractile, free only at the sides, connected in front with the skin of the forehead, from which they are not separated by a cross groove.

B. Snout extended forward as a small conical projection beyond the premaxillaries; colour pattern essentially of narrow zebra-like markings.

.....The Log Perch. *Percina.*

BB. Snout not extended forward as a conical projection beyond the premaxillaries.
C. Colour pattern consisting of about 7 large, well-defined dark blotches along the side, more or less confluent.....Black-sided Darter. *Hadropterus.*
CC. Colour pattern consisting of small, irregular dark blotches.
.....Iowa Darter. *Poecilichthys.*
AA. Premaxillaries protractile.
D. No black bar below eye; no black spot at front and back of spinous (first) dorsal.....Tessellated darters. *Boleosoma.*
DD. Distinct black bar below eye; black spot at front and back of spinous (first) dorsal.....River Darter. *Imostoma.*

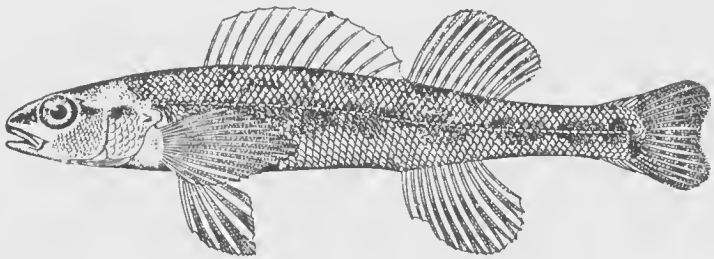
Log Perch. *Percina caprodes zebra* (Agassiz)
(Zebra fish, manitou darter)



(From Jordan and Evermann)

This is the largest of our darters and attains a length of six inches. It is fairly common through the Lake Winnipeg system and has also been found in lakes north of The Pas. As the name implies, it bears very pronounced bars of dark coloration.

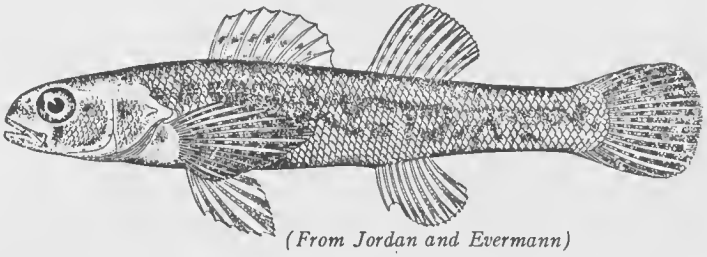
Black-sided Darter. *Hadropterus maculatus* (Girard)



(From Jordan and Evermann)

This darter does not exceed a length of about three inches. It prefers moving water. Recorded by Eigenmann (1894) from Red River at Winnipeg and Assiniboine at Brandon as *H. aspro* and from Red River at Winnipeg by Eigenmann and Eigenmann (1893) as *H. guntheri.*

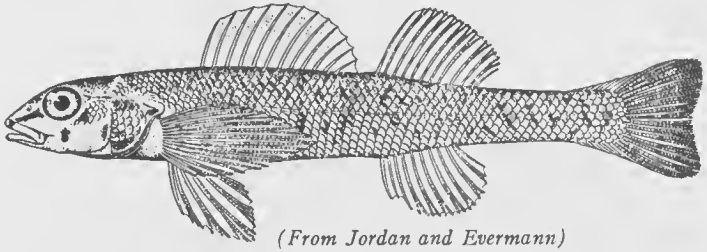
Iowa Darter. *Poecilichthys exilis* (Girard)



(From Jordan and Evermann)

This species attains a maximum length of about two and one-half inches. It is fairly widely distributed in running water throughout the southern portion of the province. During the breeding season in the spring this species assumes a brilliant green and red coloration. Formerly known under the name *Etheostoma iowae.*

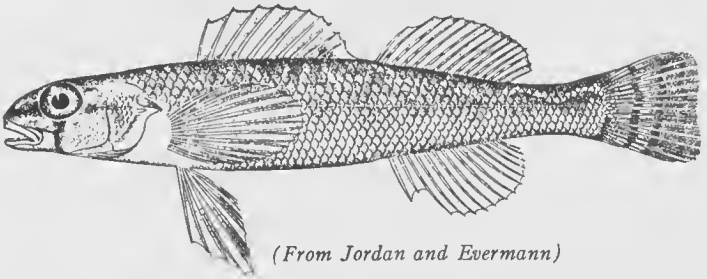
Johnny Darter. *Boleosoma nigrum* (Rafinesque)



(From Jordan and Evermann)

This is the most common and widely distributed of our darters. It rarely exceeds two inches in length and is to be found in both still and moving waters. It is a hardy and interesting aquarium fish.

River Darter. *Imostoma shumardi* (Girard)



(From Jordan and Evermann)

This small species, which is marked by the very prominent black stripe through the eye, was recently found in the Winnipeg River. and likely occurs in other streams of the southern region.

THE BASSES. Family CENTRARCHIDAE

This family of purely North American game fishes includes about forty species. In Manitoba there are three genera, which can be separated as follows:

KEY TO GENERA OF MANITOBA BASSES

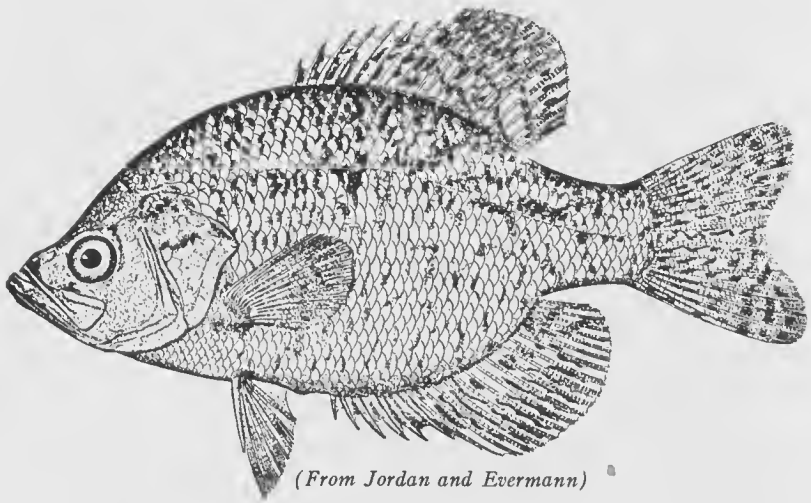
A. Dorsal and anal fins almost equal in size; anterior profile concave.
.....The Calico-Bass. *Pomoxis.*

AA. Dorsal fin much larger than the anal; anterior profile convex.

B. Spinous and soft rayed portions of the dorsal not separated by a deep notch; depth of body about two-thirds its length; anal spines 6.
.....The Rock Bass. *Ambloplites.*

BB. Spinous and soft rayed portions of dorsal separated by a deep notch; depth of body about one-third its length, anal spines 3.
.....The Black Basses. *Micropterus* and *Huro.*

Calico Bass. *Pomoxis nigro-maculatus* (Le Sueur)
(Black crappie; strawberry bass)



(From Jordan and Evermann)

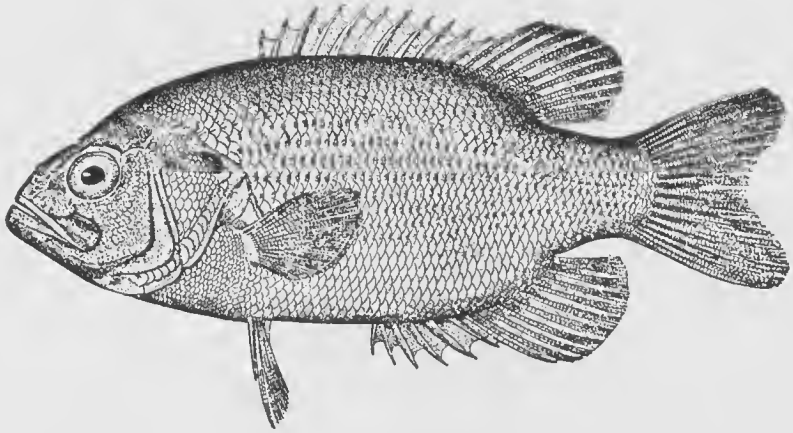
The calico bass is found commonly from Texas to the northern United States. Manitoba appears to be just at the northern limit of its range, as it occurs only in the southern streams such as the Red and Assiniboine rivers, and there quite rarely.

It feeds principally on insects and can be taken on a variety of small artificial lures. In consequence, it is a popular game fish throughout its range, despite its small size.

Formerly known as *Pomoxis sparoides.*

Rock Bass. *Ambloplites rupestris* (Rafinesque)

(Red-eye; goggle-eye)
(Rupestris = of the rocks)



(From Jordan and Evermann)

The general distribution of the rock bass corresponds with that of the preceding species, but it is found in Manitoba at least as far north as the Narrows on Lake Winnipeg. It is fairly abundant in some eastern lakes and in the Assiniboine River as far west as Brandon.

The rock bass spawns in the spring and deposits its one or two thousand eggs in a nest located in very shallow water. As usual, the male fish undertakes the care of the eggs and young.

Although its small size of less than a pound bars it from the top ranks of the game fishes, the rock bass is highly esteemed as a pan-fish and will provide good sport if fished for with light tackle. It feeds upon a wide variety of aquatic organisms—fishes, crayfish, insects, etc., any of which can be used as bait. It will also take an artificial fly or small spinning lure.

THE BLACK BASSES. Genera *Micropterus* and *Huro*

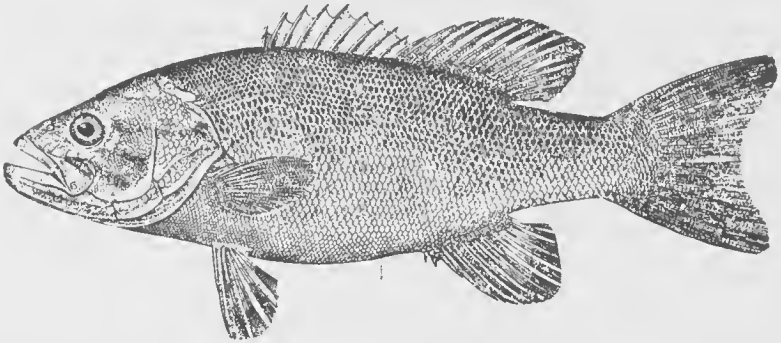
These genera can be distinguished by means of the following key:

A. Tip of maxillary not extending beyond the eye; about 17 rows of scales on the cheek.....The Smallmouth Black Bass. *Micropterus dolomieu.*

AA. Maxillary extending beyond the eye; about 10 rows of scales on the cheek.
.....The Largemouth Black Bass. *Huro salmoides.*

The bioligist surveys the small-mouth black bass at the outlet of West Hawk Lake.
Photo by G. E. Butler

Smallmouth Black Bass. *Micropterus dolomieu* Lacépède
(Tiger bass, jumper)



(From Jordan and Evermann)

Distribution.—This black bass occurs naturally in the fresh waters of North America from Texas to Eastern Canada. Its occurrence in Manitoba is due to artificial introduction and its range has been similarly extended to other parts of the continent, and even to Europe and Africa. In Manitoba it is found only in West Hawk Lake, which was stocked in 1924, and occasionally in Caddy Lake, Lake Winnipeg and the Winnipeg River. The fish prefers clear, cool streams or lakes such as are to be found in the eastern part of the province.

Food and Growth.—The smallmouth black bass is piscivorous and feeds chiefly on other fishes, crustacea and insects and their larvae. The size attained varies greatly with the waters from which the fish is taken. In most localities the maximum weight is about five pounds.

Breeding.—The breeding activities of this species are of considerable interest and, as they take place in clear shallow water, observation is not difficult. As the spawning time approaches, in the month of June in these latitudes, the male fish can be seen engaged in the construction of a nest. This consists of a shallow depression some two feet in diameter scooped out of a gravel bottom in from one to six feet of water. Gravel is arranged in this depression with large pebbles at the centre, smaller stones outside and the whole is swept scrupulously clean by vigorous fanning with the fins.

After all is in readiness, the male goes in search of a female, secures her (often at the expense of a terrific battle with a rival

male) and guides her to the nest. Here, after a brief eourtship, the eggs are deposited. These number from one to twelve thousand, depending upon thc age and size of the fish. One male may eourt several females in sueeession, or one female may be lured to several nests before all her eggs are voided.

When spawning is eompleted, the male drives his mate from the nest, whieh he thcn guards with great vigilanee throughout the ineubation period. He maintains a patrol baek and forth over the nest, fanning the eggs with his fins, and will attaek savagely any intruder no matter how large. During this time, although he will strike aggressively at a lure dragged near the nest, the male fish swallows no food.

In from a few days to two weeks, depending upon the water temperature, the eggs hateh and the fry, burdened with a yolk-sac, huddle amongst the stones of the nest. After the yolk-sac is absorbed the little fish gradually rise in a body from the nest and in about a week are herded shoreward and dispersed by their guardian.

Value.—With the possible exception of the trouts, more has been written with regard to the sporting qualities of the blaek bass than about any other freshwater fish—and deservedly so, for it is, in the words of one authority, "inch for inch and pound for pound the gamest fish that swims." Anyone who has experienced the smashing strike and indomitable, leaping fight of the bass will heartily endorse this opinion.

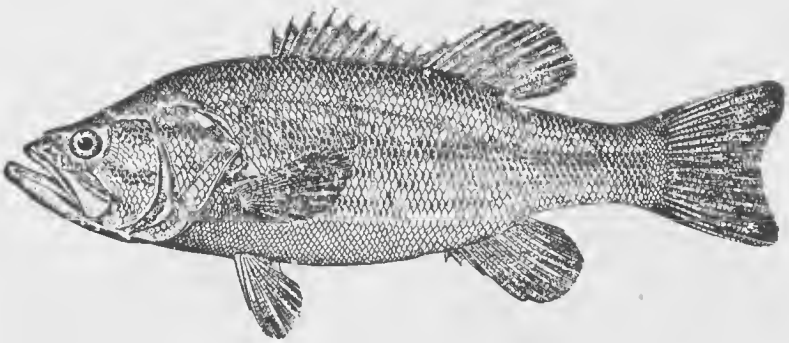
The bass may be taken in a variety of ways—still-fishing with worm, minnow or erayfish, trolling or easting with a plug or spinner, and, best of all, fly-easting with a buektail or spinner fly or the wide variety of bass flies and "bugs."

Largemouth Black Bass. *Huro salmoides* (Lacépède)

(Strawbass, green-bass)

Distribution.—The general range of this fish is similar to that of the smallmouth, although it extends farther southward into Florida and Mexieo. It is by ehoiee a fish of warm, shallow lakes and sluggish streams, but is often found in waters which also support the smallmouth.

It was reported many years ago from the Red River, but has not been taken by the author anywhere in the province. It has been introduced into Manitoba waters several times in the past with



Largemouth Black Bass. Huro salmoides. (From Jordan and Evermann)

but one recapture to date. This fish was taken from Lake Minnewashta near Morden in September 1943.

Food and Growth.—The food of the largemouth is generally similar to that of the smallmouth, but its marked liking for frogs is well known and exploited by anglers.

The growth varies considerably with the waters from which it is taken, but is usually very rapid and exceeds that of the smallmouth. In the southern part of its range, specimens over twenty pounds in weight are not uncommon, but to the northward the maximum size is about eight pounds, with an average of three or four.

Breeding.—The breeding time and habits correspond fairly closely with those of the smallmouth, but the nest is usually constructed on a more muddy bottom amongst aquatic plants. The young fish have a very conspicuous black stripe running along the sides of the body.

Value.—As a game fish, the largemouth is not quite so highly regarded as its relative, due to its more sluggish habits. Under similar conditions of environment, however, there seems little to choose between them. The greater size of the largemouth more than compensates for any difference in fighting ability.

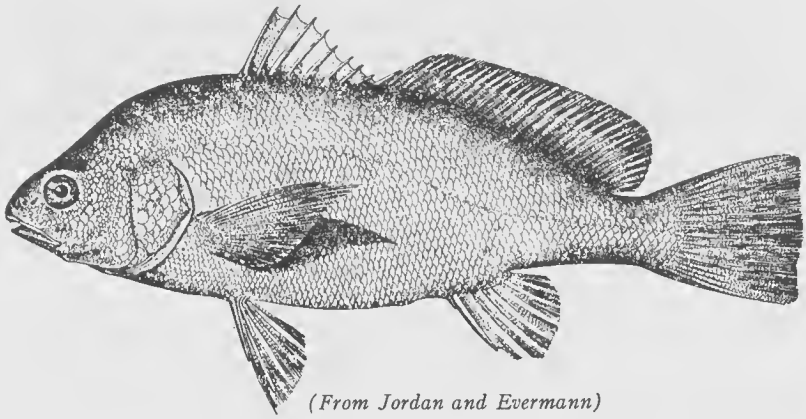
THE DRUMS. Family SCIAENIDAE

This is a large marine family, including about one hundred and fifty species. In North America there is a single freshwater species, which is found in Manitoba.

Sheepshead. *Aplodinotus grunniens* Rafinesque

(Drum; sunfish; silver bass; grunter)

(Grunniens = grunting)



(From Jordan and Evermann)

Distribution.—This interesting fish is distributed from Mexico northward throughout the Mississippi Valley and Great Lakes system. The exact northern limit of its distribution is not known. In Manitoba it is most abundant in the larger rivers, such as the Red and Assiniboine, and occurs in Lake Winnipeg, but rarely in Lake Manitoba.

Food and Growth.—The sheepshead is a bottom feeder and subsists principally on bottom organisms—insect larvae, crustaceans and molluscs. The hard shells of the molluscs are crushed by means of three toothed plates located in the throat.

In weight the sheepshead reaches a maximum of fifty pounds, but locally the average size is about six pounds.

Breeding.—Apart from the fact that the fish is a spring spawner, very little is known regarding its breeding habits.

Value.—Although it is a fish of considerable value in the south, it is not highly prized as a food fish here. Some 20,000 pounds are marketed commercially, but much of the catch is consumed by the fishermen themselves.

It is of some interest to local anglers, as it migrates up rivers in great numbers during the month of June and can be taken by angling at that time. Below the dam at Lockport good catches are made, using live crayfish for bait, and the deep and powerful body of the fish allows it to put up an excellent fight. Occasional specimens are taken on artificial lures.

A peculiar feature of this fish is the construction of the air bladder, which enables it to make strange grunting noises both in and out of the water.

THE SCULPINS. Family COTTIDAE

This is a large family of some 300 species including chiefly marine fishes. They are bottom dwelling fishes, usually found amongst the rocks in shallow water, but some of the marine species descend to great depths. They are of little or no importance as food or game fishes.

As there are both marine and freshwater species in Manitoba, the following key is divided into two sections.

SECTION I—FRESHWATER SCULPINS

Few freshwater sculpins have been recorded from Manitoba. The following key will serve to identify any likely to occur.

A. Gill-membranes attached to side of wide isthmus far behind the eye; dorsal fins scarcely separated.

B. Preopercular spine long and spirally curved; lateral line complete. ..... *Cottus ricei* Nelson.

BB. Preopercular spine short and little curved; lateral line terminating below base of second dorsal.

C. Three soft rays in ventral fins..... *Cottus cognatus* Richardson.

CC. Four soft rays in ventral fins..... *Cottus bairdii* Girard.

AA. Gill-membranes free from isthmus and uniting at an acute angle below the eye; dorsal fins widely separated..... *Triglopsis thompsonii* Girard.

Slimy Muddler. Cottus cognatus
(*From "A Biological Survey of the Oswego River System."*)

The sculpins or, as they are also called, miller's thumbs, muddlers or bullheads, are infrequently encountered in our waters. They are

Miller's Thumb. Cottus bairdii
(From Manual of The Vertebrates of The United States, Pratt)

small fish, up to six inches in length, and are found on the bottom, both in the larger lakes and rivers. They have no direct economic value, but are excellent bait for larger fishes.

SECTION II—MARINE SCULPINS OF HUDSON BAY

Although these fish have no commercial or sporting value, their abundance near the Manitoba coast of Hudson Bay makes it desirable that they be at least listed here.

A. Body scaleless above; the skin smooth or prickly. No bony armature to lateral line.

B. Preopercle with 3 spines only, the upper one straight.
.....The Great Sculpins. *Myoxocephalus.*
Species: *M. quadricornis*(Linnaeus), *M. groenlandicus* (Cuvier & Valenciennes), *M. scorpioides* (Fabricius).

BB. Preopercle with 4 spines, the upper one stout, armed with 2 or 3 antlerlike processes.....The Stag-horn Sculpins. *Gymnocanthus.*
Species: *G. galeatus* Bean, *G. tricuspis* (Reinhardt).

AA. Body more or less scaly above, the scales sometimes arranged in bands, or sometimes modified as bony plates which are placed at the base of dorsal or along lateral line.

C. Palatines with teeth. Back with a series of plates along each side below base of dorsal (above lateral line).....The Two-horned Sculpins. *Icelus.*
Species: *I. bicornis* (Reinhardt).

CC. Palatines without teeth. Back with a series of bony tubercles along base of dorsal.....*Triglops.*
Species: *T. pingeli beani* Gilbert.

THE STICKLEBACKS. Family GASTEROSTEIDAE

In this family four genera and ten species are listed in Halkett's Check List of the Fishes of the Dominion of Canada and Newfoundland. Three genera with one species in each may be listed as Manitoban fishes.

KEY TO THE SPECIES OF MANITOBA GASTEROSTEIDAE

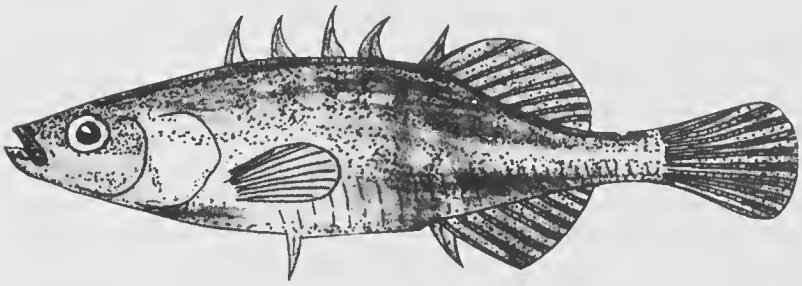
A. Gill-membranes united medially to isthmus, not forming a free fold; dorsal spines 3. .....Threespine Stickleback. *Gasterosteus aculeatus.*

AA. Gill-membranes confluent, forming a broad free fold across isthmus; dorsal spines 5 to 11.

B. Dorsal spines 5 to 6, scarcely divergent; tail without trace of keel; caudal peduncle deeper than wide; caudal fin rounded. .....Brook Stickleback. *Eucalia inconstans.*

BB. Dorsal spines 8 to 11, strongly divergent; tail with a sharp lateral keel; caudal peduncle much wider than deep; caudal fin lunate. .....Ninespine Stickleback. *Pungitius pungitius.*

Brook Stickleback. *Eucalia inconstans* (Kirtland)

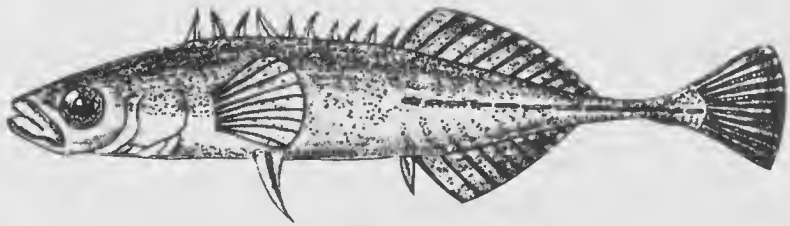


(Original drawing, A. D. Bajkov)

Widely distributed in Canada and the United States. Confined to fresh water. In Manitoba it is found in lakes and streams both large and small. Many an angler begins a fishing career by taking sticklebacks in childhood days.

Of value as a forage fish.

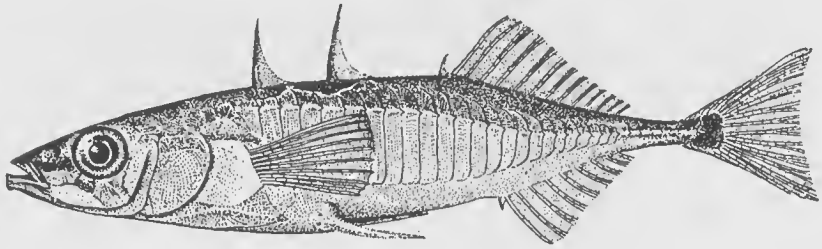
Ninespine Stickleback. *Pungitius pungitius* (Linnaeus)



(Original drawing, A. D. Bajkov)

Found in both fresh and salt waters of the Northern Hemisphere. In Manitoba generally well distributed in the smaller cooler lakes. Used as forage by larger fish.

Threespine Stickleback. *Gasterosteus aculeatus* Linnaeus



(From Jordan and Evermann)

In salt and fresh waters of the Northern Hemisphere and south to Northern Africa. Reported from Hudson Bay, and is thus included in the fishes of Manitoba.

THE CODFISHES. Family GADIDAE

This family contains 150 species, which are, with one exception, confined to salt water. These fishes are widely distributed in northern seas and many of them are valuable food fish. In Manitoba there are two marine forms and the single freshwater representative of the family.

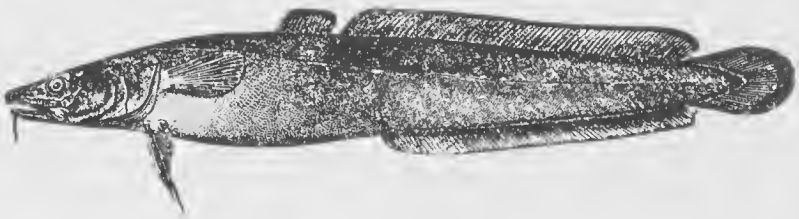
KEY TO THE SPECIES OF MANITOBA GADIDAE

A. One anal and two dorsal fins; freshwater.....Burbot. *Lota lota maculosa.*
AA. Two anal and three dorsal fins; marine.
1. Caudal fin concave behind; lower jaw longer than upper.
.....Arctic Cod. *Boreogadus saida.*
2. Caudal fin not concave behind; lower jaw shorter or equal to upper in length.
.....Greenland Cod. *Gadus ogac.*

Burbot. *Lota lota maculosa* (Le Sueur)
(Maria; ling; lawyer)
(Maculosa = spotted)

Distribution.—The burbot, or ling, as it is commonly but erroneously called, is distributed throughout the entire northern portion of this continent. In Manitoba it is found in all waters of fairly low temperature and is particularly common in the larger deep lakes.

Food and Growth.—Although it feeds to some extent on crustaceans and insect larvae, the burbot preys chiefly upon other fishes, particularly tullibee and young whitefish. Tullibee caught in gill



Burbot. Lota lota maculosa. (From Jordan and Evermann)

nets are often found to have been completely scaled by burbot in their efforts to swallow them. In very deep lakes the burbot, in turn, serves as food for the lake trout.

A weight of fifteen pounds is attained, but the average size is less than a third of this.

Breeding.—The burbot is one of the earliest spawners amongst local fish. In Lake Winnipeg the spawning season is late January and early February in the channel areas. As many as a million minute eggs may be produced by a single female.

Value.—In Europe the burbot is highly regarded as a food fish, but here, strangely enough, it is not considered fit even for dog-food. This prejudice seems to be based largely on the somewhat unattractive external appearance of the fish, for the flesh, when properly cooked, is white, flaky and excellent in flavour.

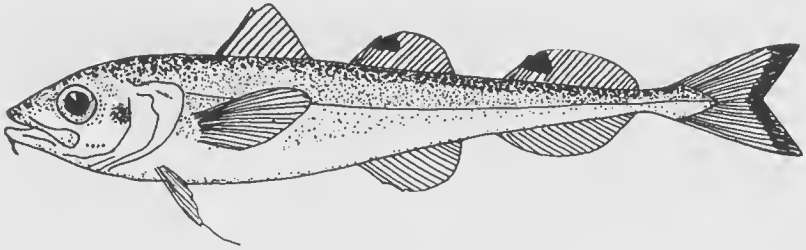
The liver is exceptionally large, and its weight may be more than one-tenth that of the rest of the body. This organ is used as food by Indians to some extent, but is far too rich for most palates. The liver oil, however, has the same medicinal qualities as that of the marine cod and, in fact, contains a higher percentage of vitamins A and D. For these reasons it is possible that the fish may become of some commercial importance in the future.

The burbot bites readily at a baited hook, but has no particular value as a game fish.

Arctic Cod. *Boreogadus saida* (Lepechin)

This marine species, circumpolar in distribution, is fairly common in Hudson Bay. It is normally a pelagic, or open ocean, fish, but is sometimes found near the mouths of larger rivers.

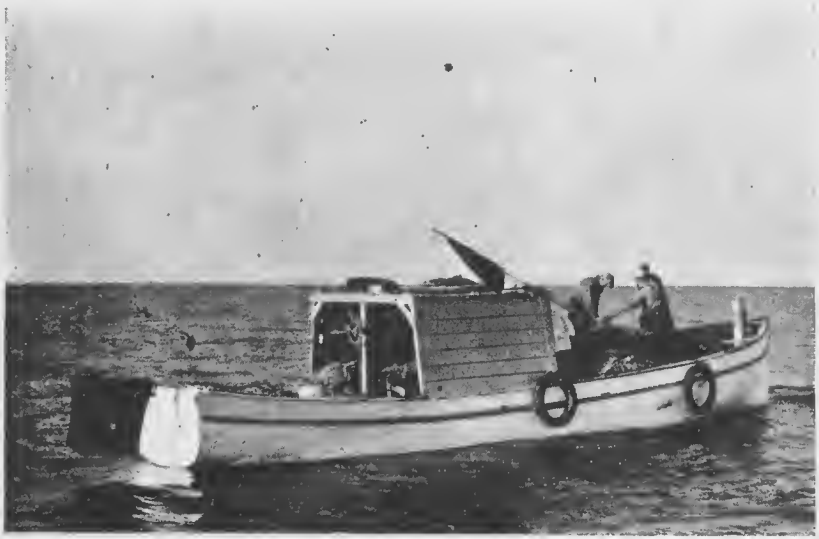
The Arctic cod rarely exceeds twelve inches in length and, therefore, has little economic importance.



Arctic Cod. Boreogadus saida. (Original drawing, A. D. Bajkov)

Greenland Cod. *Gadus ogac* Richardson

The general range of this species is from Greenland to Labrador and it is found, though not in great abundance, in Hudson Bay. It is a large fish, comparable in size to the Atlantic and Pacific cods.



Harvesting "Selkirk Whitefish" during the Lake Winnipeg summer whitefish season. This is the largest fishery of its kind in Canada, yielding over four million pounds annually of the highest quality whitefish. *Photo by G. E. Butler.*

DISTRIBUTION AND ABUNDANCE

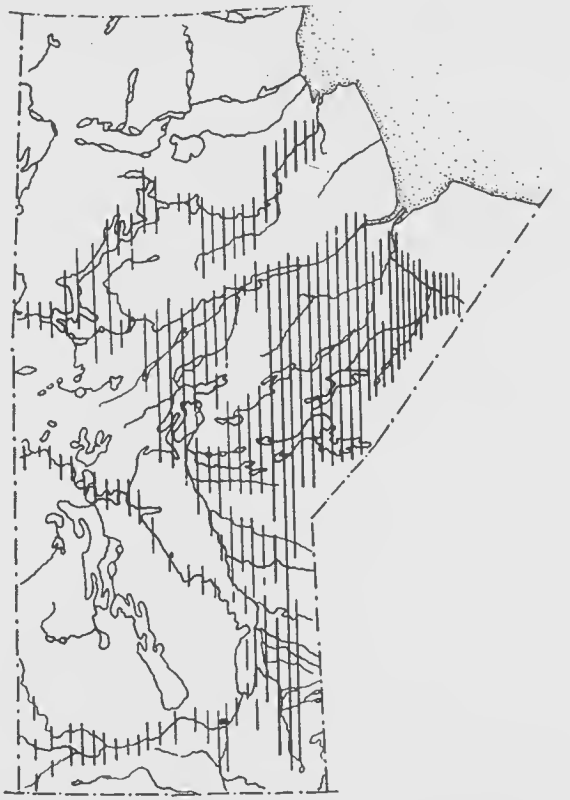
The reasons why certain species of fish are to be found only in definite localities (see charts, pages 88, 90 aud 92) must be sought for amongst a great number of factors which would require another book for their detailed consideration. It is thought, however, that a summary of the more important of these factors may help to answer some of the questions frequently asked by fishermen.

Geology.

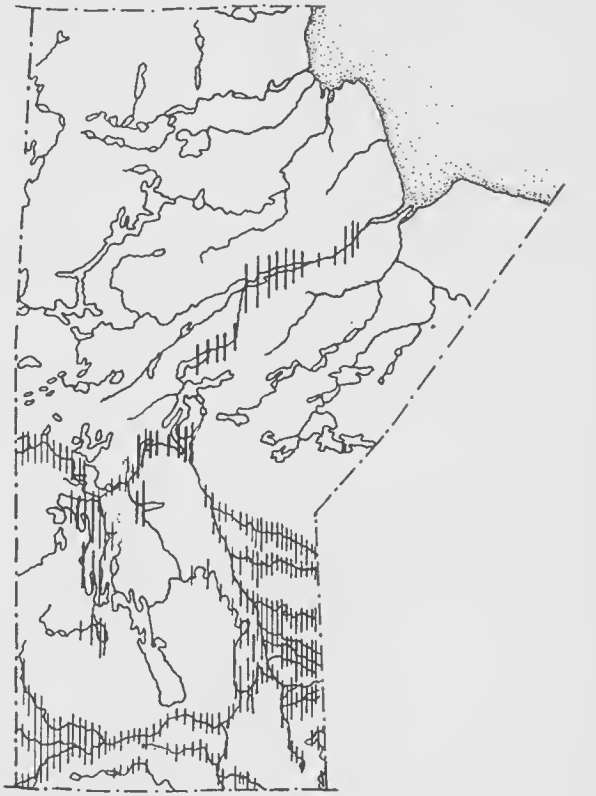
To answer the question as to where the fishes of Manitoba came from would involve a study of geological and evolutionary matters stretching back some 400 million years to the time when fishes first began. Such a study has no place in this book, but a review of the recent geological history of Manitoba, in so far as it affects the fishes, may be of interest.

Some few thousand years ago, during the period termed the Pleistocene by geologists, great ice sheets covered this region and, naturally, no fish existed. As the climate changed and became warmer, the ice melted and there was left the largest of the American glacial lakes—Lake Agassiz. This body of water, with a total area of 110,000 square miles, covered large parts of Saskatchewan, Manitoba and Ontario in Canada, and extended southward into North Dakota and Minnesota. At the height of its development, Lake Agassiz was still blocked to the northward by the receding ice sheets and drained southeastward through the Warren River into the Mississippi system. At this time many groups of southern fishes, such as the catfishes, suckers, pikes, basses and others, penetrated the area that is now Manitoba. Later, as the ice retreated farther northward, the lake came to drain into Hudson Bay through the Nelson and Hayes rivers and certain northern fishes, such as the trouts and whitefishes, also entered the system. Through the centuries, as Lake Agassiz gradually dried up to leave Lake Winnipeg and the smaller lakes of Manitoba, certain forms of fish were eliminated, but others persisted and exist as our present ichthyofauna or "fish-life."

Due to this original mingling of southern and northern families, there are no endemic or purely native species of fish in the province. The goldeye is sometimes regarded as strictly Manitoban, but this



Map I—Distribution of the sturgeon, *Acipenser fulvescens*, in Manitoba.



Map II—Distribution of the goldeye and mooneye (Family Hiodontidae) in Manitoba.

is true only from a commercial viewpoint, for the species occurs, although in limited numbers, in regions adjacent to the province. All other species are quite widely distributed in various parts of the continent.

From the geological viewpoint the province may be divided roughly into three areas: (1) the Precambrian, of gneiss and granite rocks, which extends from the Ontario boundary to the eastern shore of Lake Winnipeg and from the northern tip of this lake northwestward; (2) the Palaeozoic, of limestones and dolomites, which covers the central region, and (3) the Mesozoic shales found in the southwestern corner.

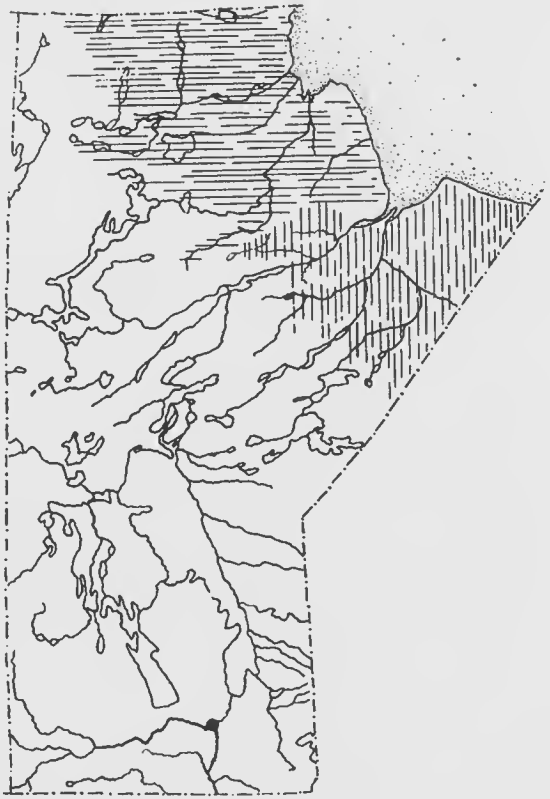
The first, or Precambrian region, is characterized by comparatively deep lakes and clear, rapid streams with numerous waterfalls, where the best angling is to be had. The second, or Palaeozoic area, with its large but fairly shallow lakes and sluggish streams, contains the most important commercial fisheries. The third, or Mesozoic region, has only small shallow lakes and streams which, for the most part, are full only during spring floods. This area, though most important to the agriculturist, is the least satisfactory from the standpoint of the fisherman.

Topography.

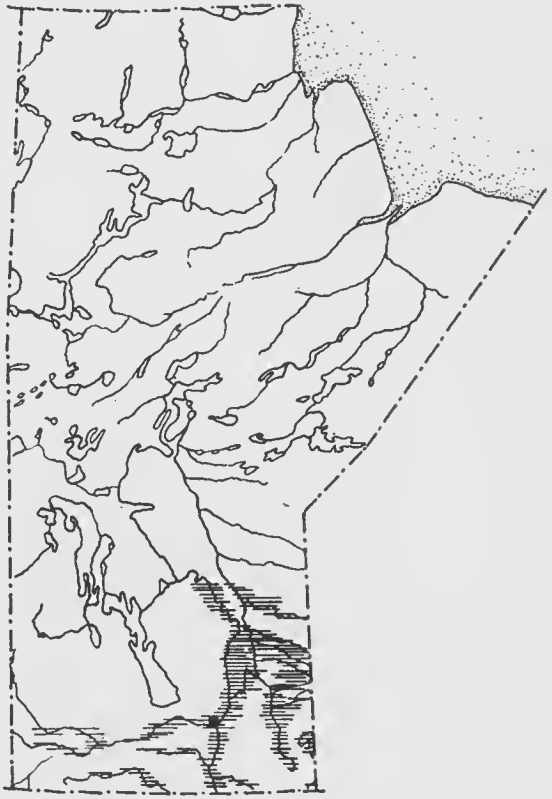
The province of Manitoba may be described as a great plain sloping gently towards the north. The area covered is slightly more than a quarter of a million square miles, and of this some eight per cent is occupied by water. All these waters belong to the Hudson Bay drainage system, of which the three principal channels are the Nelson, the Churchill and the Hayes rivers. The three largest lakes—Winnipeg, Winnipegosis and Manitoba—and their three largest tributary rivers—the Red, Assiniboine and Saskatchewan—empty into Hudson Bay by way of the Nelson River. The Churchill River system includes the fourth largest lake in the province, Southern Indian Lake, and certain other waters of northern Manitoba. The Hayes River drains the northeastern corner of the province. The heights of land between these systems constitute an effective barrier to the migration of fishes, and are responsible in some measure for the very limited distribution of certain species.

Physical and Chemical Factors.

Temperature.—Every species of fish can exist only between certain limits of temperature. This range varies not only for the different



Map III—Distribution of the grayling and brook trout in Manitoba. Grayling, horizontal lines; brook trout, vertical lines.



Map IV—Distribution of the basses (Family Centrarchidae) in Manitoba.

species but for individuals, and even for different life-cycle stages. Some fish, like the suckers and minnows, can live in water which exceeds a temperature of 80° F., but others, such as the whitefishes and trouts, require cooler water.

In addition to its direct effect, temperature is the chief factor which controls the reproductive activities of fishes. Spawning will take place only when the temperature reaches a certain level, which varies for the species. If abnormal weather conditions either hasten or delay the advent of this level, spawning will take place earlier or later, sometimes with disastrous effects.

Oxygen.—The dissolved oxygen content of the water is perhaps the most important single factor which regulates the lives of fishes. The minimum requirements of the various species vary. However, for most of the larger local species a dissolved oxygen content of less than four parts per million by weight can be regarded as dangerously low. The amount of oxygen which is contained in water depends, in turn, upon various conditions, such as temperature, light (in its relation to aquatic plants), surface agitation caused by winds, currents, rapids, etc., amount of pollution, either natural or artificial, and so on.

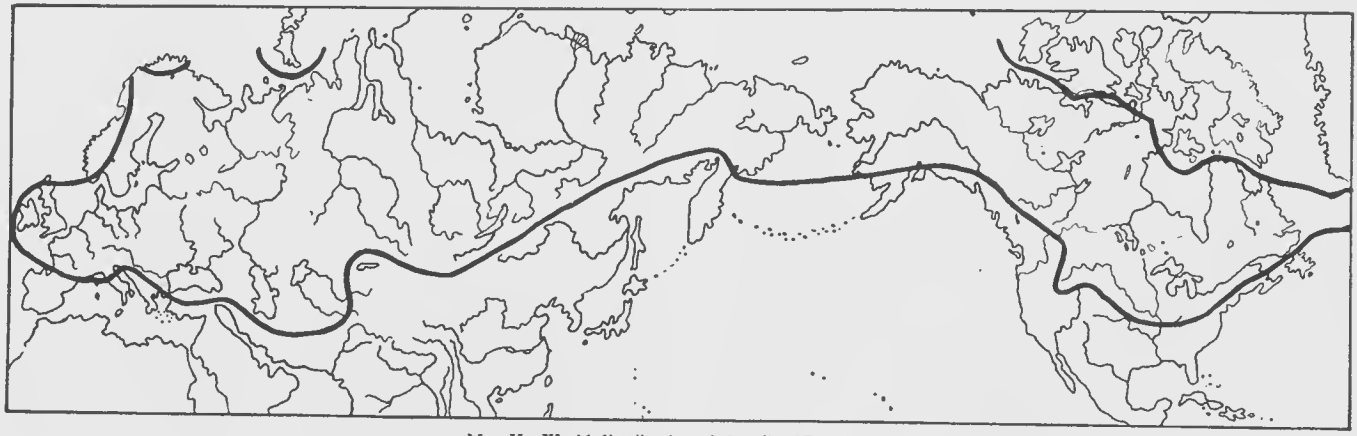
Oxygen shortage usually becomes harmful in shallow weedy lakes during the winter-time, when the oxygen supply is gradually exhausted by the respiration of organisms and the decomposition of plant and animal remains and cannot be replenished by surface agitation. In mid-summer, too, oxygen shortage may be caused by heavy rainstorms which wash such an abundance of organic matter into the lake that the dissolved oxygen, already depleted by high temperatures, becomes exhauted.

Other factors, such as dissolved salts, acidity or alkalinity, suspended materials, currents and so on, all play parts of greater or lesser importance in regulating abundance of fishes.

Biological Factors.

Food.—An adequate amount of food of the proper quality is, obviously, of primary importance to any species of fish. All other conditions may be ideal in a certain body of water, but, if the proper food supply is lacking, fish will not exist, or at least will become stunted or deformed.

Breeding Grounds.—Almost all fish are quite particular in their choice of breeding grounds: Pike ascend streams or marshy areas;



Map V—World distribution of the pike (*Esox lucius*).

whitefish spawn on "honeycomb" reefs and on boulders or gravel bottoms; bass construct nests on certain types of bottom, and so on. If the correct conditions required do not exist in any body of water the species cannot thrive.

Predators.—Many species of fish, as well as birds such as mergansers, cormorants, ospreys and pelicans, and mammals such as mink, otter and bear, are enemies of fish. Unless they occur in very large numbers, however, these "natural" predators tend to have a beneficial effect upon a fish population by the elimination of weaklings. Only in the case of man's commercial activities is there an authentic record of the almost complete annihilation of a species of fish by predation. The whitefish fishery that was established on Lake Manitoba in the closing years of the last century, now non-existent, could be given as an example. Another good example of such depletion is the sturgeon fishery that flourished on the Lake of the Woods in the latter part of the last century. At the present time a sturgeon is rarely seen in these waters and it is now forbidden to take this species by any means in that part of the Lake of the Woods situated in the state of Minnesota.

Parasites.—There is probably no species of local fish which does not play host to a large number of parasites. Fungi, bacteria, unicellular animals, tapeworms. roundworms and crustacea all have species which attack fish either externally or internally, yet only rarely do these appear to act as limiting factors. Epidemic diseases sometimes cause trouble amongst fish closely confined in hatcheries, but such epidemics amongst fish living a "natural" life are rare.

Even these few brief paragraphs should indicate the complexity of the factors which are operative in the aquatic environment. The study of these factors and the ways in which they affect the abundance and distribution of fishes is a work of more than purely scientific importance, for upon a wide understanding of such matters depends the proper use, expansion and conservation of our fisheries. Although this work is still in its preliminary stages in Manitoba, we can look forward with confidence to the time when "aquiculture" may be placed on the same basis as agriculture and it will be possible to "plant" and "harvest" aquatic crops as we now do those of the land.

INDEX

	Page
Acipenser fulvescens	15
Acipenseridae	15
Ambloplites rupestris	74 & 75
Ameiuridae	58
Ameiurus melas	59
Ameiurus nebulosus	59
Amia calva	18
Amiidae	18
Amphiodon alosoides	19
Aplodinotus grunniens	80
Basses	74
Black	74 & 75
Black, largemouth	75 & 79
Black, smallmouth	75 & 77
Calico	74
Rock	74
Biological Factors	91
Bloater	31
Body Structure and Function— The Fishes	1
Boleosoma nigrum	73
Boreogadus saida	84 & 85
Bowfin	18
Buffalofish, largemouth	37 & 38
smallmouth	37 & 38
Bullheads	58
Burbot	84 & 85
Campostoma anomalum	44 & 47
Carp	44 & 45
Carpiodes cyprinus	39
Catfishes	58
Cat, Channel	58
Stone	58 & 62
Catostomidae	36
Catostomus, catostomus	39 & 40
Catostomus, commersonnii	39 & 40
Centrarchidae	74
Charrs	23
Arctic	23 & 24
Chrosomus eos	44 & 48
Chub, Creek	45 & 57
Flathead	45 & 57
Chub, Hornyhead	45 & 56
Lake	45 & 55
Silver	45 & 56
Classification of Fishes	10
Codfishes	84
Cod, Arctic	84
Greenland	84
Coregonidae	26
Coregonus clupeaformis	31
Cottidae	81
Cottus bairdii	81 & 82
cognatus	81
ricei	81
Couesius plumbeus	45 & 55
Cristivomer namaycush	22
Ctenoid Scale	2
Cyprinidae	43 & 44
Cycloid Scale	2
Cyprinus carpio	44 & 45
Dace	45 & 54
Blacknosed	54 & 55
Finescale	44 & 49
Longnosed	54 & 55
Redbelly	44 & 48
Darters	67 & 71
Blacksided	72
Iowa	73
Johnny	73
River	73
Distribution and Abundance	87
Drum, Freshwater	79
Erimyzon sucetta	43
Esocidae	62
Esox lucius	62
Masquinongy	62 & 64
Etheostomidae	67 & 71
Eucalia inconstans	83
Gadidae	84
Gadusogac	84 & 86
Gasterosteidae	82 & 83
Gasterosteus aculeatus	84
Geology	87

	Page
Gill, of Fish	2
Glossary of Technical Terms	95
Goldeye	19
Graylings	35
Gymnocanthus galeatus	82
Gymnocanthus tricupsis	82
Hadropterus maculatus	72
Heterocercal Tail	2
Hiodon tergisus	19 & 21
Hiodontidae	19
Homocercal Tail	2
Huro salmoides	75 & 79
Hybognathus nuchalis	44 & 48
Hybopsis storerianus	45 & 56
Hyborhynchus notatus	44 & 48
Hypentelium nigricans	40 & 41
Icelus bicornis	82
Ichthyomyzon castaneus	14
Ictalurus lacustris	58
Ictiobus bubalus	38
Identification of Fishes	11
Imostoma shumardi	73
Inferior Mouth	2
Key to the Families	12
Lamprey, chestnut	14
Leucichthys artedi	27 & 29
hoyi	27 & 31
nigripinnis	27 & 28
nipigon	27 & 28
tullibee	27 & 29
zenithicus	27 & 28
Literature	97
Log Perch	72
Lota lota maculosa	84 & 85
Madtom	58 & 61
Marsipobranchii	12
Megastomatobus cyprinella	38
Micropterus dolomieu	75 & 77
Minnows	43
Bluntnose	44 & 48
Fathead	44 & 47
Redfin	50 & 54
Rosey-face	50 & 52
Silvery	44 & 48
Spot-tail	50 & 51
Mooneyes	19 & 21
Moxostoma anisurum	41 & 42
aureolum	41 & 42
rubrequs	41
Mouth, Inferior	2
Mouth, Terminal	2
Mudfishes	64
Mudminnow	64
Muddler, Slimy	81
Muskellunge	62 & 64
Myoxocephalus	82
groenlandicus	82
quadricornis	82
scorpioides	82
Nocomis biguttatus	45 & 56
Notemigonus crysoleucas	44 & 49
Notropis	44, 50 & 51
atherinoides	50 & 51
blennius	50 & 53
cornutus	50 & 52
deliciosus	50
dorsalis	51 & 54
heterolepis	50 & 53
hudsonius	50 & 51
rubellus	50 & 52
umbratilis	50 & 54
volucellus	51 & 53
Noturus flavus	58 & 62
Perca flavescens	67 & 70
Perches	67
log	71 & 72
yellow	67 & 70
Percidae	67
Percina	71
Percidae	67
Percina caprodes zebra	72
Percopsidae	65
Percopsis omiscomaycus	65
Petromyzonidae	12 & 14
Pfrille neogaea	44 & 49
Pharyngeal Teeth	2
Physical and Chemical Factors	89
Pike	62
Pike-Perch, yellow	67 & 68
Pimephales promelas	44 & 47
Platygobio gracilis	45 & 57

Page

Poecilichthys exilis 73
Pomoxis nigro maculatus 74
Prosopium cylindraceum
quadrilaterale ..... 27 & 34
Pungitius pungitius 83
Pyloric caeca 6

Quillback Sucker 39

Redhorses 41
Greater 41
Northern ..... 41 & 42
Silver ..... 41 & 42
Rhinichthys ..... 45 & 51
atratulus ..... 54 & 55
cataractae ..... 54 & 55

Salmo irideus 26
trutta fario 26
Salmonidae 22
Salvelinus alpinus ..... 23 & 24
fontinalis ..... 23 & 25
Sauger ..... 67 & 69
Scale, Cycloid 2
Scale, Ctenoid 2
Schilbeodes gyrinus ..... 58 & 61
Sciaenidae 79
Sculpins ..... 81 & 82
Great 82
Marine 82
Staghorn 82
Twohorned 82
Semotiuls atromaculatus ..... 45 & 57
Sheepshead 80
Shiners ..... 44, 50 & 51
Bigmouth ..... 51 & 54
Blacknose ..... 50 & 53
Common ..... 50 & 52
Golden ..... 44 & 49
Lake ..... 50 & 51
Mimic ..... 51 & 53
River ..... 50 & 53
Sand 50

Page

Sticklebacks 82
Brook 83
Ninespine 83
Threespine ..... 83 & 84
Stizostedion canadense ..... 67 & 69
vitreum ..... 67 & 68
vitreum glaucum 69
Stone Roller ..... 44 & 47
Sturgeon, Lake 15
Suckers 36
Carp 37
Chub ..... 37 & 43
Common 39
Finescale 37
Hog ..... 37, 40 & 41
Northern 39
Quillback 39
Redhorse 37
Sucking Mouth of Lamprey 2

Tail, Heterocercal 2
Tail, Homocercal 2
Teeth, Pharyngeal 2
Thymallidae 35
Thymallus signifer 35
Topography 89
Triglopsis thompsonii 81
Triglops pingeli beani 82
Trout, Brook ..... 23 & 25
Lake 22
Troutperch 65
Tullibee ..... 26, 27 & 29
Black-back 28
Black-fin 28
Light-back 28

Umbra limi 64
Umbridae 64

Whitefish ..... 26 & 31
Round ..... 27 & 34

GLOSSARY OF TECHNICAL TERMS

Adipose fin—A fleshy, fin-like projection between the dorsal and caudal fins as in trout, grayling, whitefish, tullibee and catfish. (Fig. 1, A.)

Air-bladder—A gas-filled sac lying beneath the back-bone in most fishes. (Fig. 17, Ab.)

Algae—Primitive aquatic plants often of minute size.

Anadromous—Running up rivers from the sea to spawn.

Anal fin—The fin on the ventral median line behind the vent. (Fig. 1, An.)

Anterior—Towards the head.

Anus—The vent, the external opening of the intestine.

Barbel—An elongate, feeler-like projection about the mouth, as in catfish.

Branchiostegals—Bones supporting the membranes which close the gill-openings on the lower side. (Fig. 14, Br.)

Canine Teeth—Conical teeth in the front part of the jaws.

Caudal fin—The fin on the tail. (Fig. 1, C.)

Confluent—Running together; said of dorsal fins of basses, etc.

Copepod—A minute crustacean.

Cranium—The skull.

Crustacean—A member of the Class Crustacea, which includes crabs, crayfish, shrimps, etc.

Ctenoid—Rough edged; with posterior margin rough or toothed; said of scales of most spiny-rayed fishes. (Fig. 9.)

Cycloid—Smooth edged; said of scales of most soft-rayed fishes. (Fig. 10.)

Decurved—Curved downward.

Depressed—Flattened vertically.

Dorsal fin—Fin on the back of fishes. (Fig. 1, D.)

Fauna—The animals inhabiting any particular region, taken collectively.

Gill-arches—The bony arches to which the gill-filaments are attached. (Fig. 2, Ga.)

Gill-clefts—The spaces between the gill-arches. (Fig. 17, Gc.)

Gill-filaments—The individual processes which form the gills. (Fig. 2, Gf.)

Gill-membranes—Thin membranes supported by the branchiostegals which serve to close the gill-openings from below. (Fig. 11, Gm.)

Gill-openings—Openings leading from the gills.

Gill-rakers—Bony projections on the inner surfaces of the gill-arches. (Fig. 2, Gr.)

Gills—Structures adapted for breathing the air contained in water.

Gonad—Reproductive organ. (Fig. 17, G.)

Heterocercal—Said of a tail-fin which is unequally lobed; the backbone deflected into the upper lobe. (Fig. 3.)

Homocercal—Said of a tail-fin which is equally lobed. (Fig. 8.)

Imbricate—Overlapping, like shingles on a roof.

Immaculate—Unspotted.

Inferior (mouth)—Mouth located on lower surface and overhung by a snout. (Fig. 7.)

Interorbital space—The space between the eyes.

Isthmus—The fleshy space between the gill-openings. (Figs. 11 and 12, I.)

Lacustrine—Of lakes.

Lateral line—A series of sensory tubes which form a raised line along the sides of a fish. (Fig. 1, LL.)

Mandible—The lower jaw. (Fig. 14, Md.)

Maxillaries—Outermost bones of upper jaw. (Fig. 14, Mx.)

Mollusc—Member of the Class Mollusca which includes clams and snails.

Nuptial tubercles—Pimple-like protuberances found on some fish in breeding time.

Operculum—The largest bone of the gill cover. (Fig. 14, O.)

Ovaries—Female reproductive glands.

Palatines—Two bones on the roof of the mouth. (Fig. 15, P.)

Papilla—A small fleshy projection.

Pectoral fins—The anterior or uppermost of the paired fins. (Fig. 1, P.)

Pelvic fins—(See ventral fins).

Peritoneum—The membrane lining the abdominal cavity.

Pharyngeal teeth—Teeth on bones lying on either side of the throat behind the gills. (Fig. 4.)

Plankton—Minute aquatic organisms which float or drift in the water.

Plica—Fold.

Premaxillaries—Paired bones forming the front of the upper jaw. (Fig. 14, Pm.)

Posterior—Toward the tail.

Preoperculum—A bone of the cheek. (Fig. 14, Po.)

Protractile—Capable of being thrust forward.

Pyloric caeca—Blind, finger-like appendages to the alimentary canal at the posterior end of the stomach. (Figs. 16 and 17, Pc.)

Suctorial—Adapted for sucking.

Testes—Male reproductive glands.

Ventral fins—Paired fins corresponding to posterior limbs. (Fig. 1, V.)

LITERATURE

Bajkov, A., 1928—A preliminary report on the fishes of the Hudson Bay drainage system. Can. Field-Nat., 42: 96-99.

Bajkov, A., 1933—Description of two new whitefish from Manitoban waters. Int. Rev. Hydrobiol., 29: 29-32.

Bissett, E. D. R., 1927—Freshwater fish of Manitoba. Can. Field-Nat., 41: 127-128.

Dymond, J. R., 1933—Biological and oceanographic conditions in Hudson Bay; 8. The Coregonine fishes of Hudson and James bays. Contrib. Can. Biol. Fish, 8: 1-12.

Dymond, J. R., and A. L. Pritchard, 1930—Some ciscoes or lake herrings of Western Canada. Contrib. Can. Biol. Fish., 5: 469-474.

Eigenmann, C. H., 1895—Results of explorations in Western Canada and the northwestern United States. Bull. U.S. Fish. Comm., 14: 101-132.

Eigenmann, C. H., and R. S. Eigenmann, 1892—New Fishes from Western Canada. Amer. Nat., 26: 961-964.

Eigenmann, C. H. and R. S. Eigenmann, 1893—Preliminary descriptions of new fishes from the northwest. Amer. Nat., 27: 151-154.

Evermann, B. W. and E. L. Goldsborough, 1907—A check list of the freshwater fishes of Canada. Proc. Biol. Soc., Wash., 20: 89-120.

Evermann, B. W., and H. B. Latimer, 1910—The fishes of the Lake of the Woods and connecting waters. Proc. U.S. Nat. Mus., 39: 121-136.

Forbes, S. A., and R. F. Richardson, 1908—The fishes of Illinois. Nat. Hist. Surv. Illinois, Vol. III, Ichthyology.

Grant, H. C., 1938—The commercial fishing industry of Manitoba. Econ. Surv. Bd., Winnipeg.

Halkett, A., 1913—Check list of the fishes of the Dominion of Canada and Newfoundland. Ottawa.

Hankinson, T. L., 1929—Fishes of North Dakota. Pap. Mich. Acad. Sci., Arts and Letters, 10: 439-460.

Hubbs, C. L., 1926—A check list of the fishes of the Great Lakes and tributary waters, with nomenclatorial notes and analytical keys. Mus. Zool., Univ. Mich., Misc. Pub. 15.

Hubbs, C. L., 1930—Materials for a revision of the catostomid fishes of eastern North America. Mus. Zool., Univ. Mich., Misc. Pub. 20.

Hubbs, C. L., and C. W. Greene, 1928—Further notes on the fishes of the Great Lakes and tributary waters. Pap. Mich. Acad. Sci., Arts and Letters, 8: 371-436.

Hubbs, C. L., and K. L. Lagler, 1941—Guide to the fishes of the Great Lakes and tributary waters. Cranbrook Inst. Sci. Bull. 18.

Hubbs, C. L., and M. B. Trautman, 1937—A revision of the lamprey genus *Ichthyomyzon*. Mus. Zool., Univ. Mich. Misc., Pap. 35.

Jordan, D. S., and B. W. Evermann, 1896—Fishes of North and Middle America. Bull. No. 47, U.S. Nat. Mus.

Prince, E. E., 1909—The fish and fisheries of Manitoba. Brit. Assoc. Handbook, Winnipeg.

Skaptason, J. B., 1926—The fish resources of Manitoba. Industrial Dev. Bd., Manitoba.

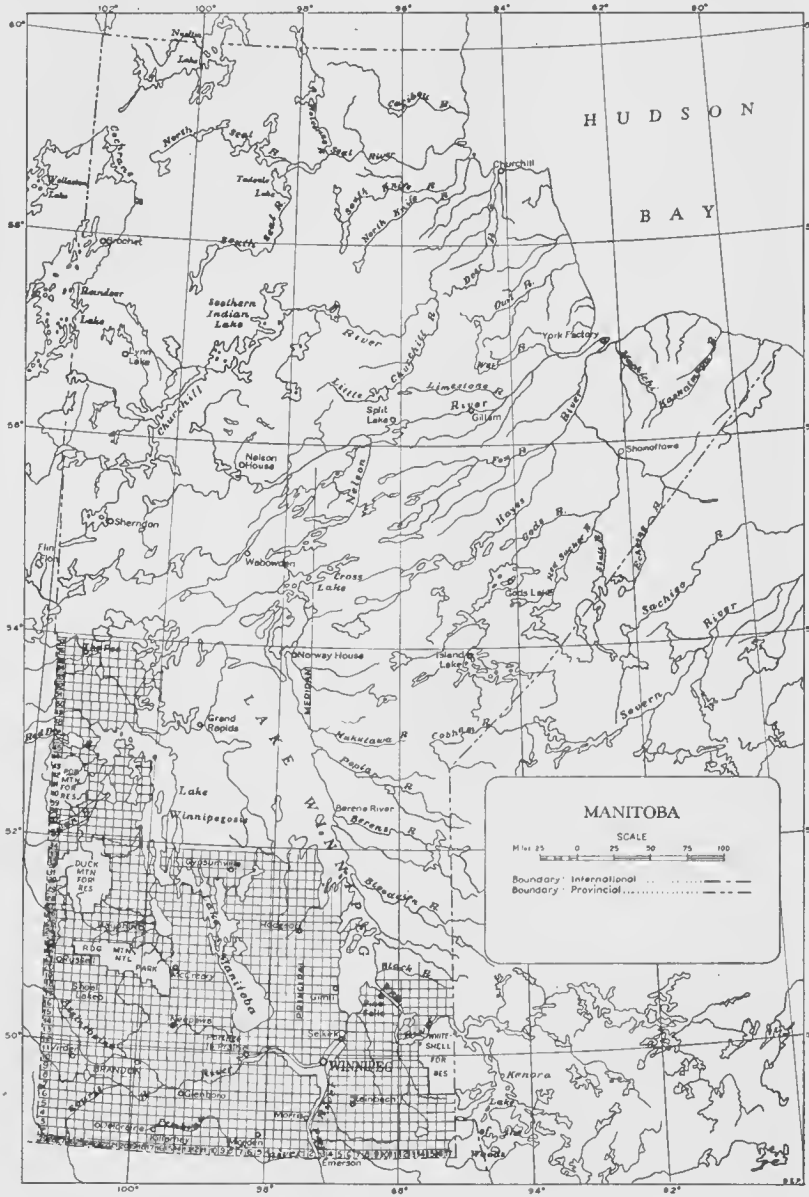
Thompson, E. S., 1898—A list of fishes known to occur in Manitoba. Forest and Stream, 51: 214.

Vladykov, V. D., 1933—Biological and oceanographic conditions in Hudson Bay; 9. Fishes from the Hudson Bay region (except the Coregonidae). Contrib. Can. Biol. Fish., 8: 13-61.

Supplement to Hinks'
"THE FISHES OF MANITOBA"

by

J. J. KELEHER
and
B. KOOYMAN


HUDSON
BAY
MANITOBA
SCALE
Miles 25 0 25 50 75 100
Boundary - International
Boundary - Provincial
LAKE WINNIPEG
WINNIPEG
BRANDON
Churchill
York Factory
Shamattawa
Sherridon
Nelson House
Wabowden
Cross Lake
Norway House
Island Lakes
Gods Lake
Grand Rapids
Lake Winnipegosis
Berens River
Pikangikum
Kenora
Emerson
Southern Indian Lake
Split Lake
Gillam
Limestone R.
Nelson R.
Hayes R.
Gods R.
Severn R.
Sachigo R.
Churchill R.
Dauphin
Portage la Prairie
Steinbach
Selkirk
Gimli
Riding Mtn. Nat. Park
Duck Mtn. Prov. Res.
Porcupine Prov. Forest
Spruce Woods Prov. Park
Whiteshell Prov. Park
Turtle Mtn. Prov. Park
Assiniboine R.
Red R.
Winnipeg R.
Saskatchewan
Ontario

Supplement to Hinks' "The Fishes of Manitoba"[1]

by J. J. Keleher[2] and B. Kooyman[3]

INTRODUCTION

Numerous requests for copies of "The Fishes of Manitoba" by David Hinks, now out of print, indicate continuing need for a text on Manitoba's ichthyofauna. To prepare an adequate successor to Hinks' book at this time is not feasible, yet to reissue it solely in its original form would be to ignore the results of that "spirit of enquiry" engendered by the book itself.

In the 14 years since "The Fishes of Manitoba" was published, there have been changes in the scientific and common names of some fishes. In addition, knowledge concerning the biology of many Manitoba fishes has been considerably clarified. In order to note these advancements, especially in nomenclature and distribution, a supplement, concerned only with the freshwater fishes, has been prepared for use with the original text. References to subsequent Manitoba studies in fishery biology have been included.

NOMENCLATURE

Within the last six years a tendency, advocated initially by Dr. R. M. Bailey of the University of Michigan, to consolidate genera of North American freshwater fishes has been evident. The suggested changes have not been incorporated throughout this supplement since it would make reference to Hinks' text difficult. However, the genera which have been affected to date are recorded in Table 1.

TABLE I. PROPOSED CHANGES IN GENERIC NAMES

Name in Hinks	Change	Reference
Cristivomer	*Salvelinus*	41 but see 54
Amphiodon	*Hiodon*	2
Leucichthys	*Coregonus*	19, 40
Prosopium	*Coregonus*	19 but see 55
Megastomatobus	*Ictiobus*	2
Hyborhynchus	*Pimephales*	2, 11
Pfrille	*Chrosomus*	52
Couesius	*Hybopsis*	2
Nocomis	*Hybopsis*	2
Platygobio	*Hybopsis*	2
Margariscus	*Semotilus*	52
Ameiurus	*Ictalurus*	52
Schilbeodes	*Noturus*	52
Hadropterus	*Percina*	6
Imostoma	*Hadropterus*	2
Poecilichthys	*Etheostoma*	2
Boleosoma	*Etheostoma*	2
Huro	*Micropterus*	5
Triglopsis	*Myoxocephalus*	55

Differences from Hinks' usage in the spelling of the specific names for the following fishes will be noted in this supplement: *Salmo gairdneri, Leucichthys artedii, Catostomus commersoni, Hybopsis storeriana, Pomoxis nigromaculatus, Micropterus dolomieui, Cottus bairdi* and *Triglopsis thompsoni.* These, with the exception of *H.*

[1]Published in May, 1957, by the Department of Mines and Natural Resources, Province of Manitoba.

[2]Biologist, Fisheries Research Board of Canada, Biological Station, Winnipeg.
[3]Fishery Biologist, Department of Mines and Natural Resources, Province of Manitoba.

storeriana[28], are the result of anticipated changes in the International Rules of Zoological Nomenclature.

The surname(s) following a scientific name is called the "authority citation". Enclosing it in parentheses shows that the species has been transferred from the original genus in which it was placed by the author. The following changes should be made in Hinks' text: *Ictiobus bubalus* (Rafinesque), *Erimyzon sucetta* (Lacépède), *Notropis umbratilis* (Girard), *Rhinichthys cataractae* (Valenciennes) and *Esox masquinongy* Mitchell.

A desirable standardization of common names of fishes is being attempted by the American Fisheries Society. The recommendations were initially published[10] in 1948 and amended since then in the 1951, 1952, and 1953 issues of the journal, "Transactions of the American Fisheries Society". While we have used the common names indicated in these publications, some species are not listed in them; hence the source for their names is indicated. The reader is urged to use these common names so that eventually the confusing use of several different local names for the same species of fish will disappear.

DISTRIBUTION

As knowledge of the distribution of fishes in Manitoba is still incomplete, statements modifying Hinks' remarks on distribution purposely have been very specific so as to indicate the present extent of our knowledge. Where such statements are not supported by literature citations or specimens listed in the appendix they are based upon sight records considered reliable by the authors. Generalizations on distribution are often a hindrance because they tend not only to discourage the publication of actually new information but also, if they become accepted, to induce errors which are difficult to correct.

Cataloguing the distribution of a species within a political unit is artificial. Only by delineating its occurrence on a continental or world basis can a full appreciation of its ecology be gained. No attempt has been made to supply the reader with the available published information since it may be found in such books as "Fishes of the Great Lakes Region"[30].

Manitoba's geographical position seems to account for some interesting distributions. According to published records, this Province is the western limit of natural distribution in Canada for 17 species of fish: *Ichthyomyzon castaneus, I. unicuspis, Salvelinus fontinalis, Semotilus atromaculatus, Nocomis biguttatus, Hybopsis storeriana, Rhinichthys atratulus, Notropis rubellus, Notropis volucellus, Hyborhynchus notatus, Schilbeodes gyrinus, Umbra limi, Fundulus diaphanus, Imostoma shumardi, Lepomis gibbosus, Pomoxis nigromaculatus, and Amblоplites rupestris.* Our original list has been reduced by recent Saskatchewan records[1]. Similarly, Manitoba is the eastern limit in Canada for three other species: *Platygobio gracilis, Notropis blennius* and *Thymallus arcticus.* The northern limit of some species also may be found in this Province.

Since distributional limits often reveal the ecological factors responsible for the restriction of further dispersal, it is evident that distributional information which may appear to be only of local interest is really of much wider importance. The Fisheries Branch of the Department of Mines and Natural Resources therefore will be most willing to assist any person in preparing a reliable record of new occurrences so that a scientifically acceptable contribution can be made.

DISCUSSION OF INDIVIDUAL SPECIES

Ichthyomyzon castaneus — Chestnut lamprey, p. 14.

The chestnut lamprey has been reported from lakes Manitoba[29] and Winnipeg[32] and from the Red and Assiniboine rivers[29]. Hinks' record from the Winnipeg River should be verified since it is within the probable distribution of the silver lamprey.

Ichthyomyzon unicuspis—Silver lamprey.

This species, rarely collected in Manitoba, should be added to our faunal list. It can be distinguished from the chestnut lamprey by its unicuspid rather than bicuspid circumoral teeth. Manitoban records have been

limited, so far, to the lower Nelson[15, 29] and Hayes rivers[29].

Acipenser fulvescens—Lake sturgeon, p. 15.

Distribution in the lower regions of the Hudson Bay drainage system includes the Seal River which flows into the Bay north of Churchill. Sturgeon are still taken on the Assiniboine River as far west as Brandon.

Amphiodon alosoides—Goldeye, p. 19.

This species is found in the Red Deer River emptying into Lake Winnipegosis and is taken in commercial quantities (approximately 25,000 pounds annually) in the Churchill River system above Southern Indian Lake.

Hiodon tergisus—Mooneye, p. 19.

This species is found in Lake Winnipeg and occurs in the Nelson River at least down to Sipiwesk Lake. It has been collected from the Saskatchewan River drainage in Manitoba.

Cristivomer namaycush—Lake trout, p. 22.

This member of the char group occurs naturally in all the deeper lakes lying within the Precambrian Shield area of Manitoba which includes the Whiteshell Forest Reserve, the region east of Lake Winnipeg and most of the area north of the 54th parallel of latitude. Its range has been artificially extended to Childs, Laurie, Glad and East Blue lakes in the Duck Mountain Forest Reserve, Whitefish Lake in the Porcupine Mountain Forest Reserve and Clear Lake [42].

NOTE: The "splake", an artificial hybrid between lake trout and eastern brook trout, has been cultured in Manitoba and stocked in Hunt Lake (Township 9, Range 17E) in 1955 and 1956. The appearance of some hybrids has been described[45, 50].

Salvelinus alpinus—Arctic char, p. 24.

In Manitoba this char is found along the Hudson Bay coast and in the lower reaches of the waters flowing into the Bay[49]. It has been taken rarely as far south as the mouth of the Nelson River but becomes common northward from Churchill.

Salvelinus fontinalis—Eastern brook trout, p. 25.

The northwestern limit of the natural range of this char in North America occurs in Manitoba. The brook trout is known now to have an almost continuous distribution in suitable streams along the coast of James Bay [44] and the west coast of Hudson Bay as far north as Sam Creek near the mouth of the Nelson River. North of this the occurrence seemingly is discontinuous but it is found in the lower parts of the Churchill, South Knife, North Knife, and Seal rivers.

The species is abundant in the Gods River system as far south as Island Lake River and occurs in such tributaries as the Red Sucker, Stull and Echoing rivers. In the Nelson River it has been found upstream as far as Kettle Rapids[14].

The brook trout has had its range extended in the Province by successful introductions to streams originating in the Duck Mountain and Porcupine Mountain Forest Reserves. Trout species did not occur naturally in these streams. See NOTE under lake trout regarding the hybrid called "splake".

Salmo gairdneri — Rainbow trout, p. 26.

This member of the true trout group is not native to Manitoba but has a considerable distribution in the Province through fish cultural efforts. It has been successfully stocked in lakes which have had their original populations of fish eradicated by use of toxicants[9] and has also become established in a number of streams originating in the Duck Mountain and Porcupine Mountain Forest Reserves where no salmonids occurred naturally. Its range is being extended further each year.

Salmo trutta—Brown trout, p. 26.

The brown trout is an European fish that has been stocked in selected waters of the Province. It is known to have survived in Telford Pond.

Leucichthys spp.—Ciscoes, p. 27 ff.

The number of species of ciscoes occurring in Manitoba and their correct scientific names are at present under study. The difficulty in their classification arises in that many characters used for identification vary with the age and growth rate of the fish and probably the environmental conditions in which it lives.

Support for the occurrence of four species of ciscoes in Lake Winnipeg has been presented[31] but the presence of a fifth has been questioned[15]. A new species, *Leucichthys churchillensis* has been described from the Churchill River[21] but it may not be valid.

Thymallus arcticus—Arctic grayling, p. 35.

Thymallus signifer has been regarded as a subspecies of the Siberian fish[55]. Its range includes all of the major Hudson Bay coastal streams and their tributaries from the Owl River northward into the Northwest Territories. It is also found far inland in such northern streams as the Seal, Wolverine, and Cochrane rivers.

Carpiodes cyprinus — Quillback carpsucker, p. 39.

The quillback carpsucker has been collected in the Winnipeg River, Lake Manitoba and in Lake Winnipeg to Pigeon Bay.

On account of Hinks' reference to the synonymy of *C. cyprinus*, it should be noted that *C. velifer* (Rafinesque) is a valid species [26]. None of the Manitoba *Carpiodes* that we have examined appear to be referable to this species. Although unrecorded from North Dakota, it does occur in the Mississippi River drainage of southeastern Minnesota[4].

Hypentelium nigricans—Hog sucker, p. 40.

The records for the hog sucker from the Lake of the Woods were based on a misidentification of *Catostomus commersoni*[27]. Until actually collected, the hog sucker should be omitted from the Manitoba check list.

Moxostoma rubreques — Greater redhorse, p. 41.

M. rubreques Hubbs is a synonym of *M. valenciennesi* Jordan[40]. The range of this species probably does not include Manitoba. It is found in the Mississippi River drainage of Minnesota and Wisconsin[17]. The illustration of *M. rubreques* in "The Fishes of Manitoba" was regarded[38] as that of *M. aureolum.*

Moxostoma aureolum—Northern redhorse, p. 42.

The northern redhorse has been found in lakes Winnipeg, Manitoba, and Little Playgreen. It also occurs in the Red and Winnipeg River systems and in the western portion of the Lake Winnipegosis drainage.

Moxostoma anisurum — Silver redhorse, p. 42.

The northern limit of distribution of the silver redhorse is in Manitoba. It has been taken in the Whitemouth, Red[18], Shell and Woody rivers as well as in lakes Winnipeg and Kelsey.

Erimyzon sucetta—Lake chubsucker, p. 43.

No specimens are available to confirm its presence in Manitoba. One record of occurrence[7] does not necessarily apply and another from an adjoining region[22] apparently has not been accepted[17, 30].

Cyprinus carpio—Carp, p. 45.

The distribution of the carp is extending in the Province[16]. A specimen was examined from Lake Manitoba in 1947, Lake Dauphin in 1954, Dawson Bay on Lake Winnipegosis in 1955 and Whitemud Falls (54° 45'N. 97° 53'W) on the upper Nelson River in 1956. This species has been collected in the Assiniboine River at Brandon and at Kamsack, Saskatchewan[1].

Campostoma anomalum — Stoneroller, p. 47.

The presence of the stoneroller in the Province has yet to be verified. The North Dakota record[22] is for the Missouri River drainage.

Hyborhynchus notatus — Bluntnose minnow, p. 48.

A rare Manitoba minnow because it has been found only at three localities: Winnipeg[20], St. Andrews Locks on the Red River, and Echo Lake[33].

Hybognathus nuchalis—Silvery minnow[30], p. 48.

No specimens have been obtained by us and it is not known from the Red River drainage[3]. One record[53] originated from a statement attributed to D. S. Jordan, "Upper Missouri and Red River of the North". Bajkov's record[7] does not specifically refer to Manitoba.

Hybognathus hankinsoni — Brassy minnow[30].

The brassy minnow was omitted by Hinks but has been recorded recently[3, 33].

Chrosomus eos—Redbelly dace, p. 49.

This species has been taken only in the Whiteshell Forest Reserve.

Pfrille neogaea — Finescale dace[30], p. 49.

This dace also has been collected only in the Whiteshell Forest Reserve.

Notemigonus crysoleucas — Golden shiner, p. 49.

The golden shiner has been collected in the Whiteshell Forest Reserve, Lake Manitoba, and a tributary of Lake Winnipegosis.

Notropis rubellus—Rosyface shiner[30], p. 52.

Although regarded by Hinks as only of possible occurrence in Manitoba, this shiner has been taken in the Winnipeg River system[33].

Notropis cornutus — Common shiner, p. 52.

Our records for Manitoba include the Whitemouth and Cypress rivers, and some of the western tributaries of Lake Dauphin, Swan Lake[33], and the Red River.

Notropis heterolepis — Blacknose shiner[30], p. 53.

The blacknose shiner is found in many lakes and streams of the Whiteshell Forest Reserve. It also occurs in Lake Manitoba, in smaller lakes of the Duck Mountain Forest Reserve and south of the Riding Mountain National Park and a tributary of the Red River. It has been taken as far north as latitude 55°.

Notropis volucellus — Mimic shiner, p. 53.

Specimens identified as the mimic shiner have been taken in the Winnipeg River system and in a Lake Winnipegosis tributary. The recorded northern limit is in Fishing Lake [33].

Notropis deliciosus — Sand shiner, p. 53.

This species has been identified in collections from the Red and Assiniboine River drainages. It occurs as far north as the Mossy River at Winnipegosis[33].

Notropis blennius — River shiner[30], p. 53.

Although known from the Saskatchewan River system[15], our records, with two exceptions, are confined to the immediate vicinity of the Red River.

Notropis umbratilis—Redfin shiner[30], p. 54.

The Lake of the Woods record cited by Hinks has been shown to be in error[27].

Rhinichthys cataractae — Longnose dace, p. 55.

This minnow is common and widely distributed in Manitoba as these records will indicate: Winnipeg, Red, Assiniboine, Saskatchewan, Nelson, Hayes, Gods, and Churchill River systems, tributaries of lakes Dauphin, Winnipegosis and Swan, as well as Lake Winnipeg[32] and Clear Lake[42].

Rhinichthys atratulus — Blacknose dace, p. 55.

This fish has been found in the Pembina, Whitemud, and Assiniboine River systems and in tributary streams of lakes Dauphin, Winnipegosis, and Swan. The blacknose dace has not been collected in Manitoba east of La Riviere (98° 43′W).

Couesius plumbeus—Lake chub, p. 55.

Specimens of the lake chub have been collected at West Hawk Lake, in the Saskatchewan, Gods, Nelson, and Churchill River drainages and north to South Knife Lake[33].

Hybopsis storeriana — Silver chub, p. 56.

Records are confined to the Assiniboine River at Winnipeg and the Red River system. The known northern limit has been extended to include St. Andrews Locks.

Nocomis biguttatus—Hornyhead chub, p. 56.

This chub, so far, has been found only in southeastern Manitoba[33].

Margariscus margarita — Pearl dace, p. 56.

This dace has been found in single locations from the drainage systems of the Pembina, Assiniboine, Winnipeg, Gods, and Owl rivers as well as in one lake of the Whiteshell Forest Reserve. It occurs also in a number of streams flowing from the Duck Mountain and Porcupine Mountain Forest Reserves, but specimens are taken only rarely.

Semotilus atromaculatus—Creek chub, p. 57.

The first positive record of occurrence was established by Kooyman's 1949 collection from the Little Pembina River. It has been collected in the western tributaries of lakes Manitoba, Dauphin, Swan, and Winnipegosis, and tributaries of the Red and Assiniboine rivers but not east of Dominion City.

Platygobio gracilis — Flathead chub, p. 57.

This species has been taken in Kelsey Lake (Township 54, Range 25W).

Ictalurus punctatus—Channel catfish, p. 58.

The channel catfish should not be called *Ictaluris lacustris* (Walbaum) because the description associated with *lacustris* was derived from a burbot[47]. This conclusion also was reached independently by Legendre[40].

It has been taken in the southern end of Lake Manitoba.

Ameiurus melas — Black bullhead, p. 59.

The black bullhead has been taken in shallow lakes of southern Manitoba.

Ameiurus nebulosus—Brown bullhead, p. 59.

The brown bullhead is common in the Red River system and has been taken in the Whiteshell Forest Reserve.

Schilbeodes gyrinus — Tadpole madtom[30], p. 61.

The use of the specific name, *mollis*, for this species, appears not to be warranted[52].

The occurrence of this small catfish in the Red River has been verified and its known distribution extended northward to central Lake Winnipeg[32].

Fundulus diaphanus—Banded killifish.

The first Manitoba record of this eastern species was noted by R. K. Stewart-Hay[51].

Umbra limi — Central mudminnow, p. 64.

This mudminnow occurs in the Red and Winnipeg River drainages.

Stizostedion vitreum glaucum — Blue walleye, p. 69.

The statement[25] that this subspecies occurs in the eastern portion of Lake Winnipeg has not been confirmed by the collection of specimens. It should be omitted from the Manitoba check list.

Percina caprodes—Log perch, p. 72.

The log perch has been found in the Winnipeg River system, Lake Dauphin, Whitefish Lake, Red Deer River, and in waters east of Lake Winnipeg. In northern Manitoba (north of the 54th parallel of latitude) it occurs at least to Hunter Lake.

Hadropterus maculatus — Blackside darter[30], p. 72.

Records for the blackside darter come from two separate areas—Winnipeg, Red, and Assiniboine River drainages and several tributaries of Swan Lake.

Poecilichthys exilis — Iowa darter[30], p. 73.

The distribution of this darter extends northward at least to the Saskatchewan River near The Pas.

Boleosoma nigrum — Johnny darter, p. 73.

The Johnny darter is collected more frequently than the Iowa darter and it apparently ranges into more northern waters being found at least to Southern Indian Lake.

Imostoma shumardi—River darter[30], p. 73.

The river darter appears to be sparsely distributed in Manitoba. It has been reported from the Red River[18], Winnipeg River[25], Mukutawa* River[32], and at Gladstone Heights*[32]. Subsequently, it has been collected at several more localities along Lake Winnipeg and in Lake Dauphin, Sipiwesk Lake, and the Red Deer River.

FOOTNOTE:

*Throughout the paper cited (i.e. 32) the name "Mukutawa" was spelled incorrectly as "Mukatawa". The map name "Bull Head" was used in place of the local name "Calder's Dock". "Gladstone Heights" would be a more suitable name to avoid confusion with another collecting site.

Pomoxis nigromaculatus—Black crappie, p. 74.

The black crappie is found only infrequently in Manitoba. It has been obtained from the Winnipeg River, the southern portion of Lake Winnipeg, and Minnewasta Lake. The last is an accidental introduction.

Ambloplites rupestris — Rock bass, p. 75.

This fish is distributed across eastern Canada to Manitoba. In our Province specimens have been secured only as far west as the Minnedosa River and as far north as Mukutawa River.

Lepomis gibbosus—Pumpkinseed.

The pumpkinseed has been recorded from two places in southeastern Manitoba, Telford Pond and Burton Lake.

Micropterus dolomieui — Smallmouth bass, p. 77.

The smallmouth bass is not native to Manitoba. Its introduction to Lake of the Woods in the early 1900's[44], allowed further extension of its range into Manitoba via the Winnipeg River system. The range of this bass has been extended in the Province through migration and by transplanting to include the Winnipeg River, the lower reaches of the Whiteshell River, West Hawk, Caddy, Falcon and Shoal lakes, all in southeastern Manitoba. The most northern occurrence of this species in Canada is in Lake Athapapuskow at 54° 41′ north latitude and 101° 40′ west longitude where it was introduced in 1940 and continues to survive.

Huro salmoides — Largemouth bass, p. 78.

This bass is found in two of Manitoba's lakes, Minnewasta and Silver Beach (Township 21, Range 26 W.) and a pond at Fort Whyte near Winnipeg as an introduced species. Plantings in other waters do not seem to have survived.

Aplodinotus grunniens — Freshwater drum, p. 80.

The recorded northern limit[46] of distribution is the mouth of the Limestone River which is at 56° 31′ north latitude.

Cottus ricei—Spoonhead sculpin, p. 81.

Specimens have been collected from only a few localities in Manitoba: West Hawk Lake, Bull Head, Mukutawa River[32], Saskatchewan River, and near York Factory.

Cottus cognatus — Slimy sculpin[44], p. 81.

This species is distributed from Labrador to Alaska[15]. It apparently replaces *C. bairdi* in northern Manitoba. Our most northern record for *C. cognatus* is at 58° 33′ north latitude. In southern Manitoba it is uncommon but has been collected from Armit Lake, Steeprock River, Lake Winnipeg, Clear Lake[42], Winnipeg River and a coldwater stream flowing into George Lake.

Cottus bairdi — Mottled sculpin[44], p. 81.

This sculpin is the usual species in southern Manitoba, being found in Lake Winnipeg[32] and abundantly in waters of the Whiteshell Forest Reserve. There are also two records from streams in the Duck Mountain Forest Reserve.

Triglopsis thompsoni—Deepwater sculpin[30], p. 81.

With the exception of Reindeer Lake[43] on the Manitoba-Saskatchewan boundary, the deepwater sculpin apparently has not been collected from any Manitoba lake.

Eucalia inconstans — Brook stickleback, p. 83.

The brook stickleback is very abundant in southern Manitoba. It occurs at least to streams near Churchill.

Pungitius pungitius — Ninespine stickleback, p. 83.

The ninespine stickleback has a more discontinuous distribution in southern Manitoba than the brook stickleback. It occurs in the Assiniboine River, West Hawk Lake, Lake Winnipeg[32], Aikens Lake, Armit Lake, and the Red Deer River. In collections from northern Manitoba it occurs more frequently than the brook stickleback.

Lota lota—Burbot, p. 84.

The burbot is generally considered to be a fish of lakes and large streams but young specimens have been found in many small rapid-flowing streams throughout the Province.

ACKNOWLEDGMENTS

The authors, on behalf of the Department of Mines and Natural Resources, wish to express their appreciation to the Royal Ontario Museum at Toronto for permission to publish Museum records on material from departmental surveys in Manitoba. If it were not for the interest of Dr. J. R. Dymond, former director of the Museum, and Dr. W. B. Scott, present curator of the Department of Ichthyology and Herpetology, much of the information would not be available for this supplement.

The authors are particularly indebted to Dr. Scott for the identifications on many departmental collections and for comments on the manuscript. Dr. K. F. Lagler also offered suggestions for improvement of a draft of the manuscript.

The assistance of the following persons in making collections is acknowledged: H. J. Burrell, K. C. Dey, R. D. Lyon, T. A. Paddock, R. S. Williams and Gloria Keleher. Some records from the following collectors have been used: Dr. I. G. Arnason, Mr. J. Bodnar, Mr. G. E. Butler, Dr. K. H. Doan, Mr. C. W. Douglas, Mr. T. Halgren, Mr. L. C. Hewson, Dr. P. M. Jackin, Dr. J. A. McLeod, Mr. L. T. S. Norris-Elye, Mr. K. G. Roberts, Dr. W. M. Sprules, Mr. R. K. Stewart-Hay, Mr. L. A. Sunde and Mr. C. H. Watson.

Mrs. Catherine Kostelnuk assisted in preparing the manuscript. Mr. D. E. Perry prepared the map. Particular thanks are extended to Miss S. Helen Josephson and Miss Diana J. Moroz who so willingly prepared the many drafts inevitable under a joint authorship.

REFERENCES

1. Atton, F. M. & R. P. Johnson. 1956. First records of eight species of fishes in Saskatchewan. Canadian Field-Nat. 69(3) 1955: 82-84.
2. Bailey, R. M. 1951. A check list of the fishes of Iowa with keys for identification. *In* Iowa fish and fishing, by J. R. Harlan and E. B. Speaker, pp. 185-238. Iowa State Conser. Comm.
3. ——— 1954. Distribution of the American cyprinid fish *Hybognathus hankinsoni* with comments on its original description. Copeia (4): 289-291.
4. ——— 1956. Personal communication.
5. ——— and C. L. Hubbs. 1949. The black basses (*Micropterus*) of Florida, with description of a new species. Occ. Papers Mus. Zool., Univ. Michigan No. 516, 40 pp.
6. ———, H. E. Winn and C. L. Smith. 1954. Fishes from the Escambia River, Alabama and Florida, with ecologic and taxonomic notes. Proc. Acad. Nat. Sci. Philadelphia 106: 109-164.
7. Bajkov, A. 1928. A preliminary report on the fishes of the Hudson Bay drainage system. Canadian Field-Nat. 42: 96-99.
8. Butler, G. E. 1950. The lakes and lake fisheries of Manitoba. Trans. Am. Fish. Soc. 79 (1949): 18-29.
9. ——— 1952. Two poisoning projects in Manitoba. Canadian Fish Culturist 13: 10-14.
10. Chute, W. H. et al. 1948. A list of common and scientific names of the better known fishes of the United States and Canada. Am. Fish Soc., Spec. Publ. No. 1, 45 pp.
11. Cross, F. B. 1953. Nomenclature in the Pimephalinae, with special reference to the bullhead minnow, *Pimephales vigilax perspicius* (Girard). Trans. Kansas Acad. Sci. 56(1): 92-96.
12. Derback, B. 1947. The adverse effect of cold weather upon the successful reproduction of pickerel, (*Stizostedion vitreum*). Canadian Fish Culturist 2(1): 22-23.
13. ——— 1947. The whitefish industry. The Question Mark 14(1): 38-40. Univ. Manitoba Sci. Stud. Assoc.
14. Doan, K. H. 1948. Speckled trout in the lower Nelson River region, Manitoba. Bull. Fish. Res. Bd. Canada 79, 12 pp.

15. Dymond, J. R. 1947. A list of the freshwater fishes of Canada east of the Rocky Mountains. Roy. Ontario Mus. Zool., Misc. Publ. No. 1, 36 pp.

16. ——— 1955. The introduction of foreign fishes in Canada. Verh. int. Ver. Limnol. 12: 543-553.

17. Eddy, S. and T. Surber. 1947. Northern fishes with special reference to the Upper Mississippi Valley. Univ. Minnesota Press, Minneapolis, 276 pp.

18. Eigenmann, C. H. 1895. Results of explorations in Western Canada and in the Northwestern United States. Bull. U.S. Fish Comm. 14(1894): 101-132.

19. Eschmeyer, P. H. and R. M. Bailey. 1955. The pigmy whitefish, *Coregonus coulteri*, in Lake Superior. Trans. Am. Fish. Soc. 84(1954): 161-199.

20. Forbes, S. A. and R. E. Richardson. 1908. The fishes of Illinois. Nat. Hist. Surv. Illinois, 358 pp.

21. Fowler, H. W. 1948. Fishes of the Nueltin Lake expedition, Keewatin, 1947. Part 1—Taxonomy. Proc. Acad. Nat. Sci. Philadelphia 100: 141-184.

22. Hankinson, T. L. 1929. Fishes of North Dakota. Paps. Michigan Acad. Sci., Arts and Letters, 10 (1928): 439-460.

23. Hewson, L. C. 1951. A comparison of nylon and cotton gill-nets used in the Lake Winnipeg winter fishery. Canadian Fish Culturist 11: 7-9.

24. ——— 1955. Age, maturity, spawning and food of burbot (*Lota lota*) in Lake Winnipeg. J. Fish. Res. Bd. Canada 12 (6): 930-940.

25. Hinks, D. 1943. The Fishes of Manitoba. Dept. Mines and Nat. Res., Province of Manitoba, 102 pp.

26. Hubbs, C. L. 1930. Materials for a revision of the catostomid fishes of Eastern North America. Misc. Publ. Mus. Zool., Univ. Michigan. No. 20, 47 pp.

27. ——— 1945. Corrected distributional records for Minnesota fishes. Copeia (1): 13-22.

28. ——— 1951. *Notropis amnis*, a new cyprinid fish of the Mississippi fauna, with two subspecies. Occ. Paps. Mus. Zool., Univ. Michigan No. 530, 30 pp.

29. ——— and M. B. Trautman. 1937. A revision of the lamprey genus *Ichthyomyzon*. Misc. Publ. Mus. Zool., Univ. Michigan. No. 35, 109 pp.

30. ——— and K. F. Lagler. 1947. Fishes of the Great Lakes region. Cranbrook Inst. Sci. Bull. 26, 109 pp.

31. Keleher, J. J. 1952. Growth and *Triaenophorus* parasitism in relation to taxonomy of Lake Winnipeg ciscoes (*Leucichthys*). J. Fish. Res. Bd. Canada 8(7): 469-478.

32. ——— 1952. Notes on fishes collected from Lake Winnipeg region. Canadian Field-Nat. 66(6): 170-173.

33. ——— 1956. The northern limits of distribution in Manitoba for cyprinid fishes. Canadian J. Zool. 34(4): 263-266.

34. Kennedy, W. A. 1948. Recent increases in growth rate in two species of Lake Manitoba fish. Canadian Fish Culturist 3(4): 18-19.

35. ——— 1949. Relationship of length, weight and sexual maturity to age in three species of Lake Manitoba fish. Bull. Fish. Res. Bd. Canada No. 81, 5 pp.

36. ——— 1950. The determination of optimum size of mesh for gill nets in Lake Manitoba. Trans. Am. Fish. Soc. 79(1949): 167-186.

37. ——— 1954. Tagging returns, age studies and fluctuations in abundance of Lake Winnipeg whitefish, 1931-1951. J. Fish. Res. Bd. Canada 11(3): 284-309.

38. Lagler, K. F. 1945. Review of "The fishes of Manitoba" by David Hinks. Am. Midl. Nat. 33(1): 255.

39. Lawler, G. H. 1954. Observations on the trout-perch *Percopsis omiscomaycus* (Walbaum), at Heming Lake, Manitoba. J. Fish. Res. Bd. Canada 11(1): 1-4.

40. Legendre, V. 1953. The freshwater fishes of the Province of Quebec: list of the species, ecological groups, history, nomenclature, annotations. *In* Ninth Rept. Biol. Bur. for November 1st, 1950 to April 1st, 1952: 190-295.

41. Morton, W. M. and R. R. Miller. 1954. Systematic position of the lake trout, *Salvelinus namaycush*. Copeia (2): 116-124.

42. Rawson, D. S. 1948. The failure of rainbow trout and initial success with the introduction of lake trout in Clear Lake, Riding Mountain Park, Manitoba. Trans. Am. Fish. Soc. 75(1945): 323-335.

43. ——— 1951. Studies on the fish of Great Slave Lake. J. Fish. Res. Bd. Canada 8(4): 207-240.

44. Scott, W. B. 1954. Freshwater fishes of Eastern Canada. Univ. Toronto Press, Toronto, 128 pp.

45. ——— 1956. Wendigo—the hybrid trout. Roy. Ontario Mus., Toronto, 7 pp.

46. ——— and B. Kooyman. 1952. A northern record for *Aplodinotus grunniens*. Canadian Field-Nat. 66(3): 89.

47. Speirs, J. M. 1952. Nomenclature of the channel catfish and the burbot of North America. Copeia (2): 99-103.

48. Sprules, W. M. 1947. A management program for goldeye (*Amphiodon alosoides*) in Manitoba's marsh regions. Canadian Fish Culturist 2(1): 9-11.

49. ——— 1952. The Arctic char of the west coast of Hudson Bay. J. Fish. Res. Bd. Canada 9(1): 1-15.

50. Stenton, J. E. 1950. Artificial hybridization of eastern brook trout and lake trout. Canadian Fish Culturist 6: 20-22.

51. Stewart-Hay, R. K. 1954. A killifish in Manitoba. Canadian Field-Nat. 68(2): 94.

52. Taylor, W. R. 1954. Records of fishes in the John N. Lowe collection from the Upper Peninsula of Michigan. Misc. Publ. Mus. Zool., Univ. Michigan No. 87, 50 pp.

53. Thompson, E. S. 1898. A list of fishes known to occur in Manitoba. Forest and Stream 51: 214.

54. Vladykov, V. D. 1954. Taxonomic characters of the eastern North American chars (*Salvelinus* and *Cristivomer*). J. Fish. Res. Bd. Canada 11(6): 904-932.

55. Walters, V. 1955. Fishes of Western Arctic America and Eastern Arctic Siberia, taxonomy and zoogeography. Bull. Am. Mus. Nat. Hist. 106 Art. 5: 255-368.

APPENDIX

SELECTED LOCALITY RECORDS SUPPORTING DISTRIBUTIONAL STATEMENTS

The position of a locality record is given either by section, township and range (east or west of the Principal Meridian located at 97° 28′ of west longitude) or in degrees and minutes of north latitude and west longitude. Collector's initials follow each record.

Specimens are deposited in the collections of either the Royal Ontario Museum, Toronto, or the Fisheries Research Board Biological Station, Winnipeg.

Amphiodon alosoides

Baptising Creek (31, 52, 22W) W.S.

Hiodon tergisus

Baptising Creek (31, 52, 22W) W.S.

Salvelinus fontinalis

Kanuchuan Rapids (54 22; 94 49) B.K.
Gods River (54 54; 94 04) B.K.
Bad River (56 37; 94 26) B.K.
trib. Weir River (56 46; 94 27) B.K.

Thymallus signifer

Silcox Creek (57 09; 94 10) B.K.

Carpiodes cyprinus

vicinity Delta (14, 14, 07W) J.K.
Great Falls (27, 17, 11E) J.K.
Pigeon Bay (—, 38, 03E) K.R.

Moxostoma aureolum

Birch River (11, 08, 13E) J. K.
La Salle River (20, 09, 03E) J.K.
vicinity Langruth (—, 16, 08W) J.K.
Bull Head (25, 30, 05E) L.H.
Swan River (21, 36, 27W) J.K.
Red Deer River (21, 45, 25W) W.S.
vic. Norway House (09, 58, 03W) J.K.

Moxostoma anisurum

Elma (32, 10, 12E) J.K.
vic. Winnipeg Beach (34, 17, 04E) L.H.
Shell River (08, 26, 28W) J.K.
Woody River (27, 37, 27W) J.K.
Pigeon Bay (—, 38, 03E) K.R.
Kelsey Lake (—, 54, 25W) W.S.

Cyprinus carpio

Brandon (19, 10, 18W) J.K.
Minnedosa River (34, 10, 20W) J.K.

Hyborhynchus notatus

Red River (02, 13, 04E) L.N.

Chrosomos eos

Telford Pond (20, 10, 16E) B.K.
Rennie River (24, 10, 14E) J.K.
Hanson Creek (15, 10, 16E) J.K.

Pfrille neogaea

Telford Pond (20, 10, 16E) B.K.
Rennie River (24, 10, 14E) J.K.
Brereton Lake (—, 11, 15E) J.M.

Notemigonus crysoleucas

Tie Creek (20, 14, 15E) B.K.
Burton Lake (02, 16, 15E) B.K.
vic. Whitemud River (—, 15, 08W) C.W.
Winnipegosis (10, 31, 18W) G.B.

Notropis cornutus

Little Pembina R. (28, 02, 18W) B.K.
La Riviere (19, 03, 09W) J.K.
Cypress River (08, 07, 12W) J.K.
Whitemouth River (36, 11, 11E) J.K.
Turtle River (30, 22, 15W) J.K.
Vermilion River (10, 25, 19W) J.K.
Valley River (14, 26, 26W) B.K.
Shell River (—, 30, 27W) B.K.
Winnipegosis (10, 31, 18W) G.B.
Roaring River (05, 34, 27W) B.K.

Notropis heterolepis

Caddy Lake (—, 10, 17E) B.K.
Whiteshell River (10, 12, 16E) B.K.
Wavey Creek (32, 14, 03E) J.K.
vic. Whitemud River (—, 15, 08W) C.W.
Crawford Lake (02, 18, 21W) B.K.
Persse Lake (36, 29, 29W) L.S.
Chataway Creek (54 32; 94 17) B.K.
Sipiwesk Lake (55 05; 97 35) L.S.

Notropis volucellus

Eleanor Lake (06, 14, 13E) J.K.
Tie Creek (20, 14, 15E) B.K.
Woody River (27, 37, 27W) J.K.

Notropis deliciosus

Roseau River (20, 02, 03E) J.K.
Pembina River (19, 03, 09W) J.K.
Assiniboine River (—, 10, 02E) J.K.
Minnedosa River (34, 10, 20W) J.K.
St. Andrews Locks (11, 13, 04E) G.B.

Notropis blennius

Dominion City (20, 02, 03E) J.K.
Morris (03, 05, 01E) J.K.
St. Norbert (20, 09, 03E) J.K.
Black Bear Island (25, 32, 04E) J.K.
Woody River (34, 36, 29W) B.K.

Rhinichthys cataractae

Dominion City (20, 02, 03E) J.K.
Pembina River (19, 03, 09W) J.K.
Tie Creek (20, 14, 15E) B.K.
Seven Sisters Falls (27, 13, 11E) G.B.
Souris River (34, 07, 21W) J.K.
Minnedosa River (34, 10, 20W) J.K.
Vermilion River (10, 24, 24W) J.K.
Valley River (14, 26, 26W) B.K.
Pine River (32, 32, 23W) B.K.
Swan River (21, 36, 27W) J.K.
Birch River (26, 39, 26W) J.K.
Red Deer River (21, 45, 25W) W.S.
Saskatchewan River (31, 52, 22W) W.S.
Kanuchuan Rapids (54 22; 94 49) B.K.
Chataway Creek (54 32; 94 17) B.K.
Gods River (55 06; 93 37) B.K.
Limestone River (56 31; 94 07) B.K.
trib. Weir River (56 48; 94 11) B.K.
trib. Hayes River (57 00; 92 18) K.D.
trib. Herriot Cr. (58 33; 94 22) B.K.

Rhinichthys atratulus

Mary Jane Creek (30, 03, 09W) J.K.
Cypress River (08, 07, 12W) J.K.
Eden (22, 16, 15W) J.K.
Wilson River (14, 25, 21W) K.D.
Drifting River (05, 27, 21W) K.D.
Shell River (08, 26, 27W) J.K.
Pine River (32, 32, 23W) B.K.
Roaring River (05, 34, 27W) B.K.
Woody River (34, 36, 29W) B.K.
Birch River (26, 39, 26W) J.K.

Couesius plumbeus

Indian Bay Cr. (13, 09, 17E) B.K.
Big Eddy (24, 56, 27W) W.S.
Chataway Creek (54 32; 94 17) B.K.

Gods River (54 51; 94 05) B.K.
Limestone River (56 37; 94 27) B.K.
S. Indian Lake (57 05; 98 34) B.K.
Silcox Creek (57 09; 94 10) B.K.

Hybopsis storeriana

La Salle River (20, 09, 03E) J.K.
Assiniboine River (—, 10, 02E) J.K.
St. Andrews Locks (11, 13, 04E) B.K.

Margariscus margarita

Little Pembina R. (28, 02, 18W) B.K.
Camp Lake (03, 09, 17E) G.B.
Bog River (15, 13, 09E) J.B.
Big Boggy Creek (02, 27, 29W) J.K.
Valley River (14, 26, 26W) B.K.
Pine River (32, 32, 23W) B.K.
Roaring River (05, 34, 27W) B.K.
Woody River (34, 36, 29W) B.K.
Birch River (34, 39, 26W) B.K.
Chataway Lake (54 32; 94 20) B.K.

Semotilus atromaculatus

Roseau River (20, 02, 03E) J.K.
Little Pembina R. (28, 02, 18W) B.K.
Cypress River (08, 07, 22W) J.K.
Eden (22, 16, 15W) J.K.
Turtle River (07, 21, 15W) J.K.
Valley River (14, 26, 26W) B.K.
Big Boggy Creek (02, 27, 29W) J.K.
Roaring River (05, 34, 27W) B.K.
Duck River (26, 35, 23W) J.K.
Birch River (26, 39, 26W) J.K.

Ameiurus melas

Rock Lake (15, 03, 13W) B.K.
Norris Lake (29, 17, 01E) L.S.

Ameiurus nebulosus

Pembina River (25, 03, 10E) G.B.
Ryerson Creek (21, 16, 17E) G.B.
Icelandic River (21, 23, 03E) J.K.

Umbra limi

Rennie River (24, 10, 14E) J.K.
La Salle River (02, 11, 03W) J.K.
Whiteshell River (09, 12, 16E) B.K.
Tie Creek (20, 14, 15E) B.K.

Percina caprodes

Whitemouth River (36, 11, 11E) J.K.
McMurray Creek (04, 15, 15E) B.K.
Dauphin Beach (05, 25, 27W) R.S.
Whitefish Lake (08, 39, 29W) R.S.
Red Deer River (21, 45, 25W) W.S.
Family Lake (—, 34, 15E) G.B.
Hunter Lake (56 37; 100 54) C.D.

Hadropterus maculatus

Joubert Creek (34, 05, 04E) J.K.
Birch River (11, 08, 13E) J.K.
Minnedosa River (34, 10, 20W) J.K.
Whitemouth River (36, 11, 11E) J.K.
Wavey Creek (09, 15, 04E) J.K.
Shell River (—, 30, 27W) B.K.
Roaring River (05, 34, 27W) B.K.
Woody River (27, 37, 27W) J.K.
Swan River (21, 36, 27W) J.K.
Birch River (34, 39, 26W) B.K.

Poecilichthys exilis

Big Eddy (24, 56, 27W) W.S.

Boleosoma nigrum

S. Indian Lake (57 10; 98 40) B.K.

Imostoma shumardi

Lake Dauphin (05, 25, 27W) R.S.
Gull Harbour (25, 25, 06E) J.K.
Berens River (—, 39, 03E) B.K.
Red Deer River (17, 45, 25W) J.K.
Spider Islands (—, 52, 02E) B.K.
Sipiwesk Lake (55 05; 97 35) L.S.

Pomoxis nigromaculatus

Minnewasta Lake (36, 02, 06W) G.A.
Ryerson Creek (21, 16, 17E) G.B.
off Black River (36, 21, 03E) T.H.

Ambloplites rupestris

Camp Lake (03, 09, 17E) G.B.
Elma (32, 10, 12E) J.K.
Dorothy Lake (04, 14, 13E) J.K.
Wavey Creek (32, 14, 03E) J.K.
Minnedosa River (13, 15, 18W) G.A.
Sasaginnigak Lake (—, 30, 13E) G.B.
Mukutawa River (29, 48, 01E) K.R.

Lepomis gibbosus

Telford Pond (20, 10, 16E) K.D.
Burton Lake (02, 16, 15E) B.K.

Cottus ricei

West Hawk Lake (—, 09, 17E) K.D.
Bull Head (31, 30, 06E) J.K.
Big Eddy (24, 56, 27W) W.S.
Blackwater Cr. (56 55; 92 35) K.D.

Cottus cognatus

McMurray Creek (04, 15, 15E) B.K.
Seven Sisters Falls (27, 13, 11E) G.B.
Bull Head (31, 30, 06E) J.K.
Sturgeon Bay (36, 35, 05W) B.K.
Armit Lake (—, 42, 29W) R.S.
Steeprock River (23, 43, 26W) B.K.
Kanuchuan Rapids (54 22; 94 49) B.K.
Gods River (54 51; 94 05) B.K.
McCallum Lake (56 05; 101 45) B.K.
Limestone River (56 32; 94 08) B.K.
Blackwater Creek (56 55; 92 35) K.D.
trib. Herriot Cr. (58 33; 94 22) B.K.

Cottus bairdi

West Hawk Lake (26, 09, 17E) B.K.
Crowduck Lake (30, 13, 17E) B.K.
Tie Creek (20, 14, 15E) B.K.
Pine River (32, 32, 23W) B.K.
Duck River (26, 35, 23W) J.K.

Eucalia inconstans

Insectary stream (58 45; 94 09) P.J.

Pungitius pungitius

West Hawk Lake (16, 09, 17E) B.K.
Assiniboine River (—, 10, 02E) J.K.
Red Deer River (21, 45, 25W) W.S.
Eden Lake (56 38; 100 15) B.K.
N. Indian Lake (57 20; 97 20) B.K.
South Knife Lake (58 11; 93 23) G.B.
Munroe Lake (59 08; 98 30) G.B.

Lota lota

Dominion City (20, 02, 03E) J.K.
Longpine Creek (35, 09, 17E) B.K.
La Salle River (02, 11, 03W) J.K.
Whiteshell River (18, 13, 15E) B.K.
Roaring River (05, 34, 27W) B.K.
Birch River (34, 39, 26W) B.K.
Steeprock River (23, 43, 26W) B.K.
Gods River (54 54; 94 04) B.K.
Weir River (56 56; 93 51) B.K.
Herriot Creek (58 33; 94 22) B.K.